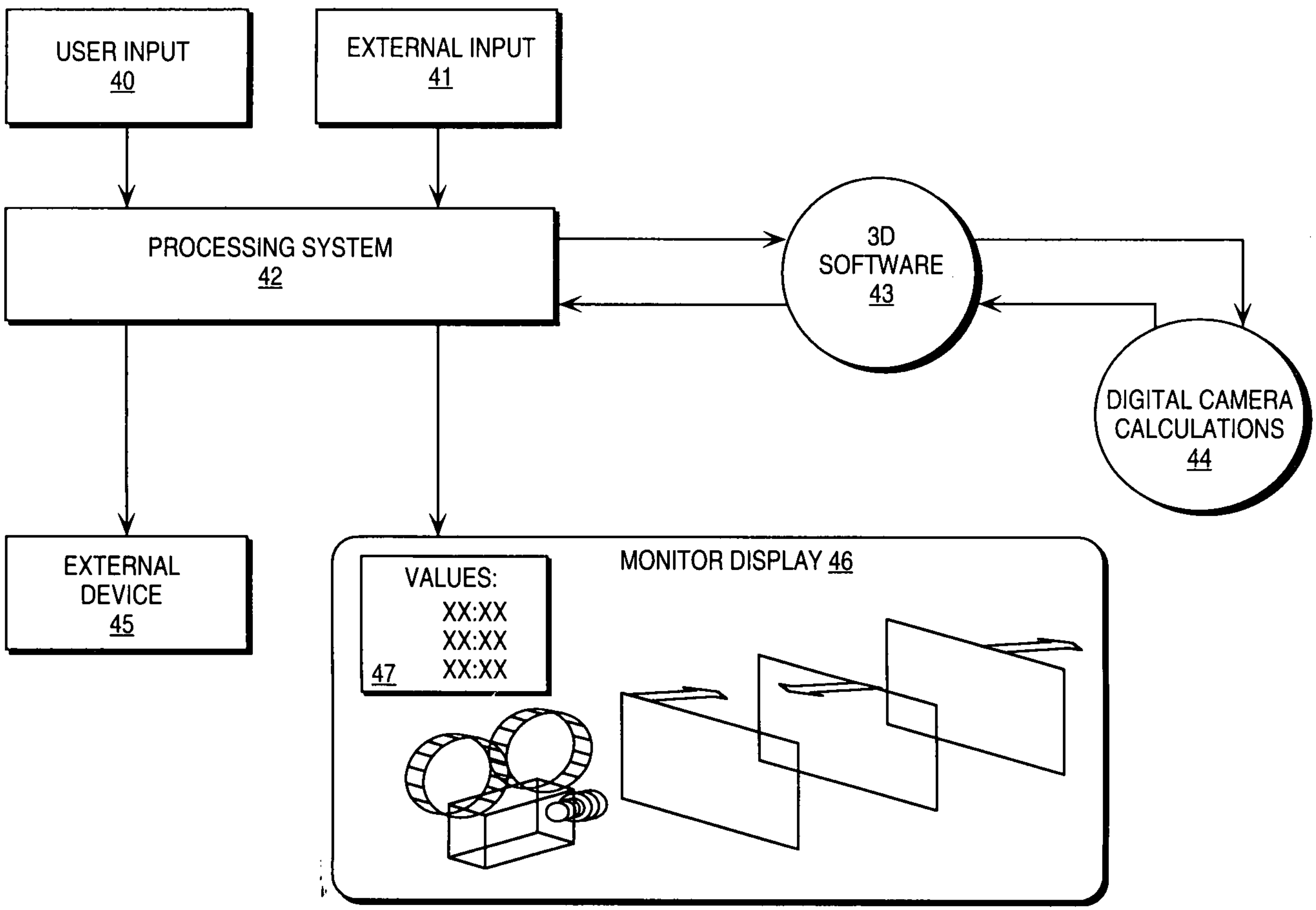

USER INPUT 40
EXTERNAL INPUT 41
PROCESSING SYSTEM 42
3D SOFTWARE 43
DIGITAL CAMERA CALCULATIONS 44
EXTERNAL DEVICE 45
MONITOR DISPLAY 46
VALUES:
XX:XX
XX:XX
XX:XX
47

FIG. 1a

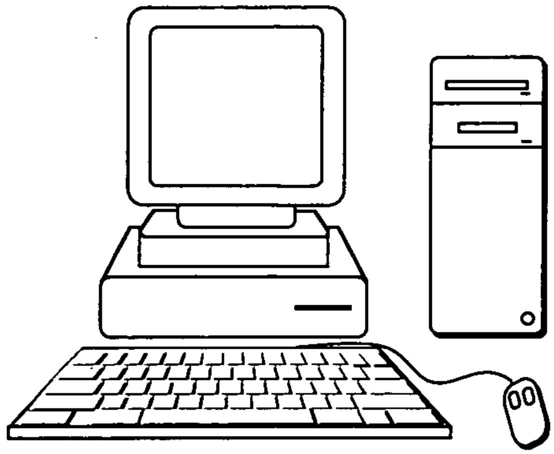


FIG. 1b

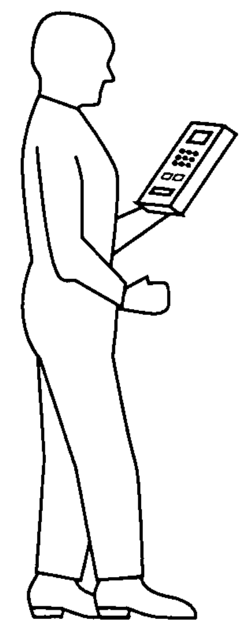


FIG. 1c

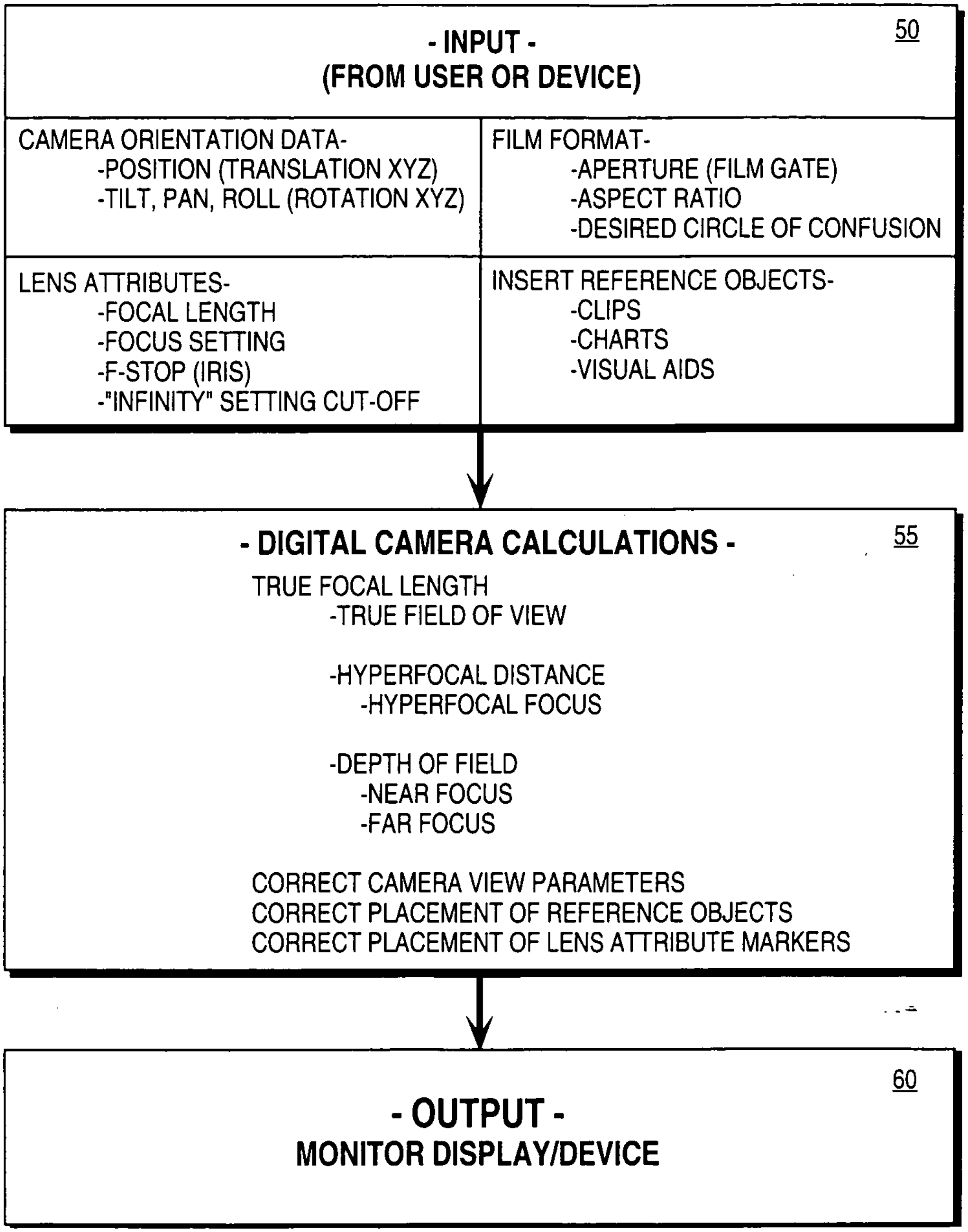

- INPUT -
(FROM USER OR DEVICE)
50
CAMERA ORIENTATION DATA-
-POSITION (TRANSLATION XYZ)
-TILT, PAN, ROLL (ROTATION XYZ)
FILM FORMAT-
-APERTURE (FILM GATE)
-ASPECT RATIO
-DESIRED CIRCLE OF CONFUSION
LENS ATTRIBUTES-
-FOCAL LENGTH
-FOCUS SETTING
-F-STOP (IRIS)
-"INFINITY" SETTING CUT-OFF
INSERT REFERENCE OBJECTS-
-CLIPS
-CHARTS
-VISUAL AIDS
- DIGITAL CAMERA CALCULATIONS -
55
TRUE FOCAL LENGTH
-TRUE FIELD OF VIEW
-HYPERFOCAL DISTANCE
-HYPERFOCAL FOCUS
-DEPTH OF FIELD
-NEAR FOCUS
-FAR FOCUS
CORRECT CAMERA VIEW PARAMETERS
CORRECT PLACEMENT OF REFERENCE OBJECTS
CORRECT PLACEMENT OF LENS ATTRIBUTE MARKERS
- OUTPUT -
MONITOR DISPLAY/DEVICE
60

FIG. 2

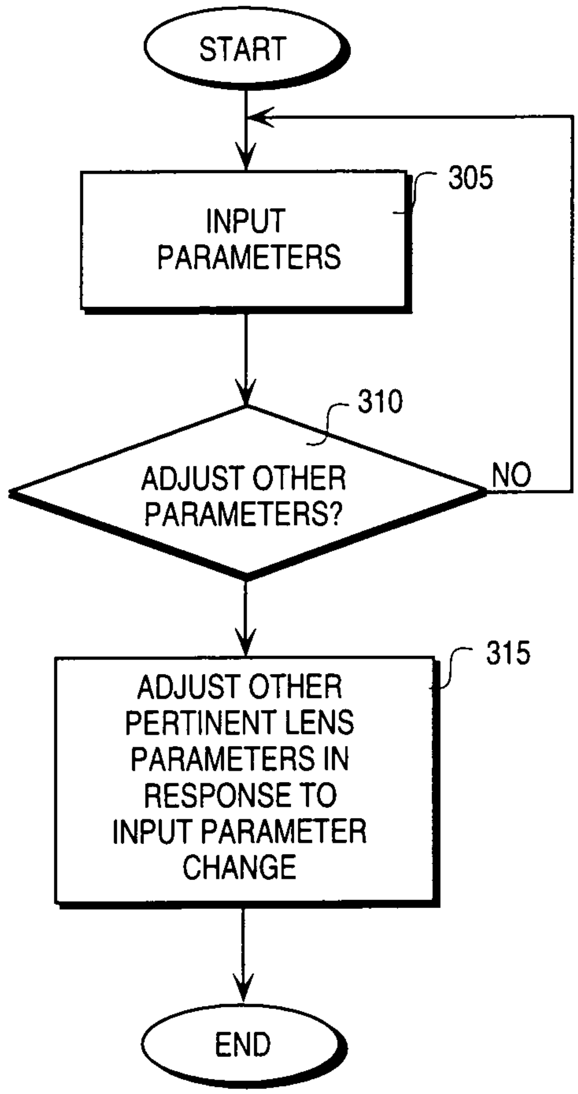

START
INPUT PARAMETERS
305
ADJUST OTHER PARAMETERS?
310
NO
ADJUST OTHER PERTINENT LENS PARAMETERS IN RESPONSE TO INPUT PARAMETER CHANGE
315
END

FIG. 3a

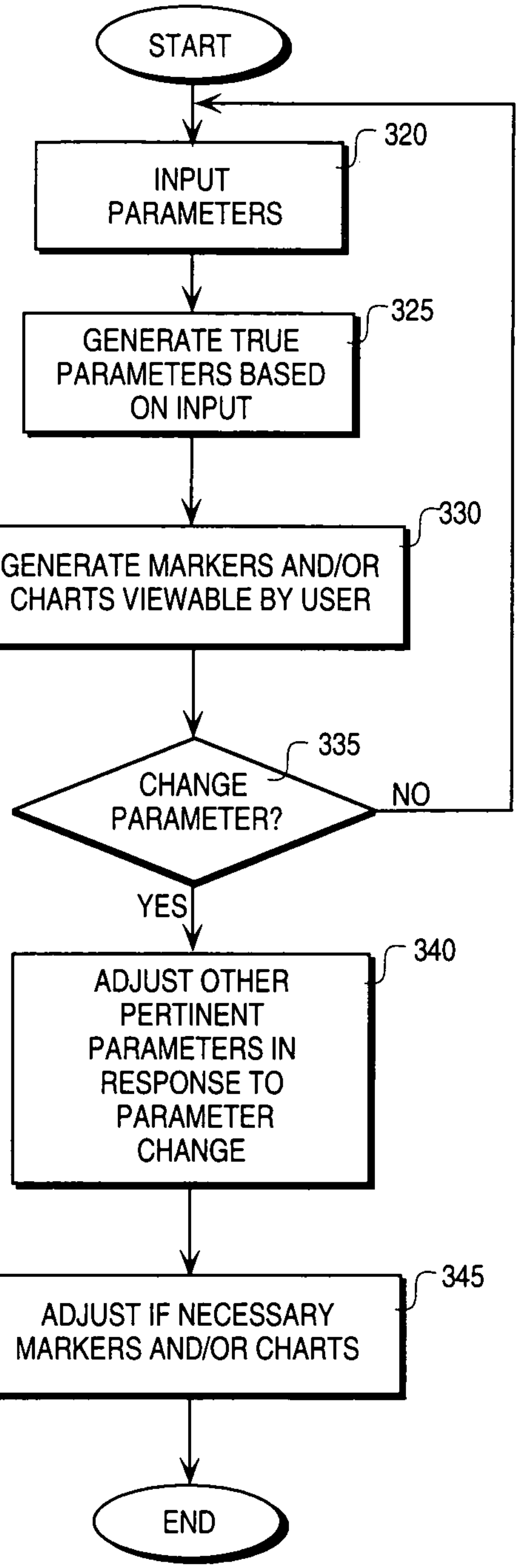

START
320
INPUT PARAMETERS
325
GENERATE TRUE PARAMETERS BASED ON INPUT
330
GENERATE MARKERS AND/OR CHARTS VIEWABLE BY USER
335
CHANGE PARAMETER?
NO
YES
340
ADJUST OTHER PERTINENT PARAMETERS IN RESPONSE TO PARAMETER CHANGE
345
ADJUST IF NECESSARY MARKERS AND/OR CHARTS
END

FIG. 3b

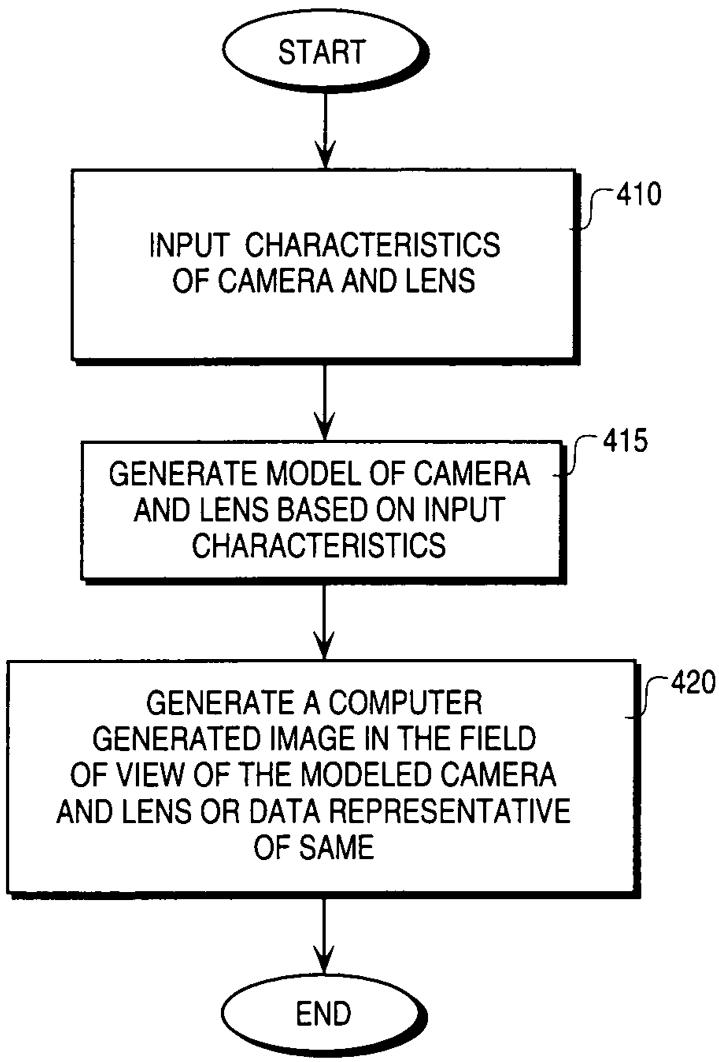

START
INPUT CHARACTERISTICS OF CAMERA AND LENS
410
GENERATE MODEL OF CAMERA AND LENS BASED ON INPUT CHARACTERISTICS
415
GENERATE A COMPUTER GENERATED IMAGE IN THE FIELD OF VIEW OF THE MODELED CAMERA AND LENS OR DATA REPRESENTATIVE OF SAME
420
END

FIG. 4a

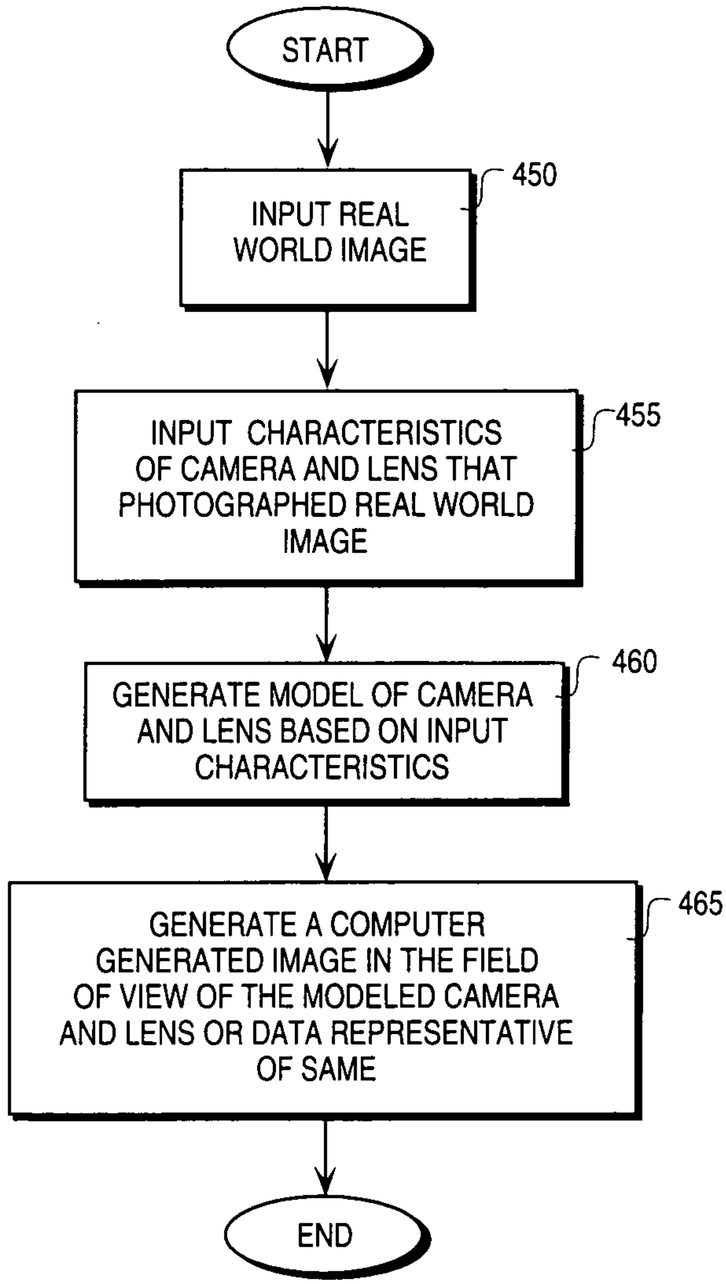

START
INPUT REAL WORLD IMAGE
450
INPUT CHARACTERISTICS OF CAMERA AND LENS THAT PHOTOGRAPHED REAL WORLD IMAGE
455
GENERATE MODEL OF CAMERA AND LENS BASED ON INPUT CHARACTERISTICS
460
GENERATE A COMPUTER GENERATED IMAGE IN THE FIELD OF VIEW OF THE MODELED CAMERA AND LENS OR DATA REPRESENTATIVE OF SAME
465
END

FIG. 4b

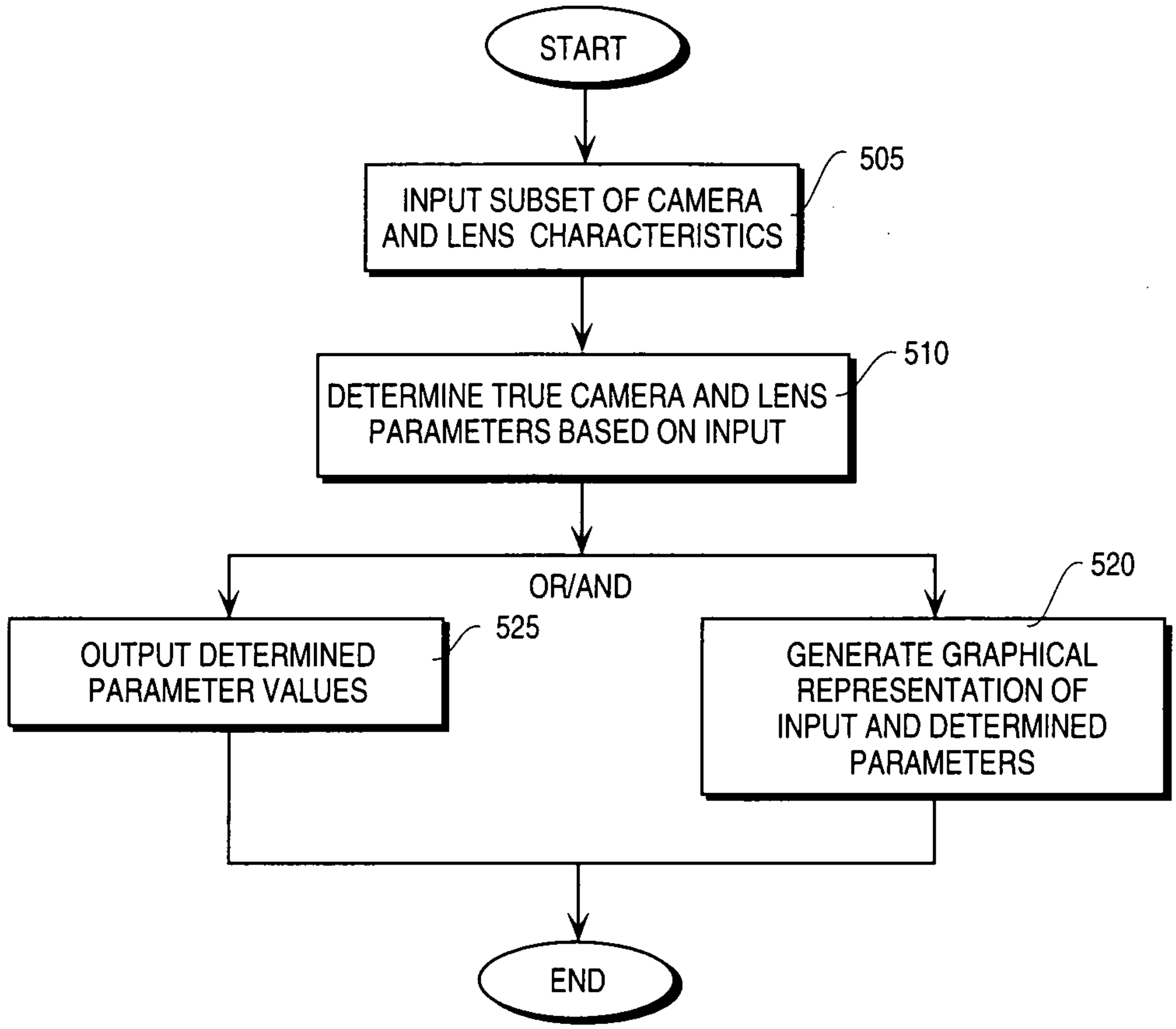

START
INPUT SUBSET OF CAMERA AND LENS CHARACTERISTICS
505
DETERMINE TRUE CAMERA AND LENS PARAMETERS BASED ON INPUT
510
OR/AND
OUTPUT DETERMINED PARAMETER VALUES
525
GENERATE GRAPHICAL REPRESENTATION OF INPUT AND DETERMINED PARAMETERS
520
END

FIG. 5

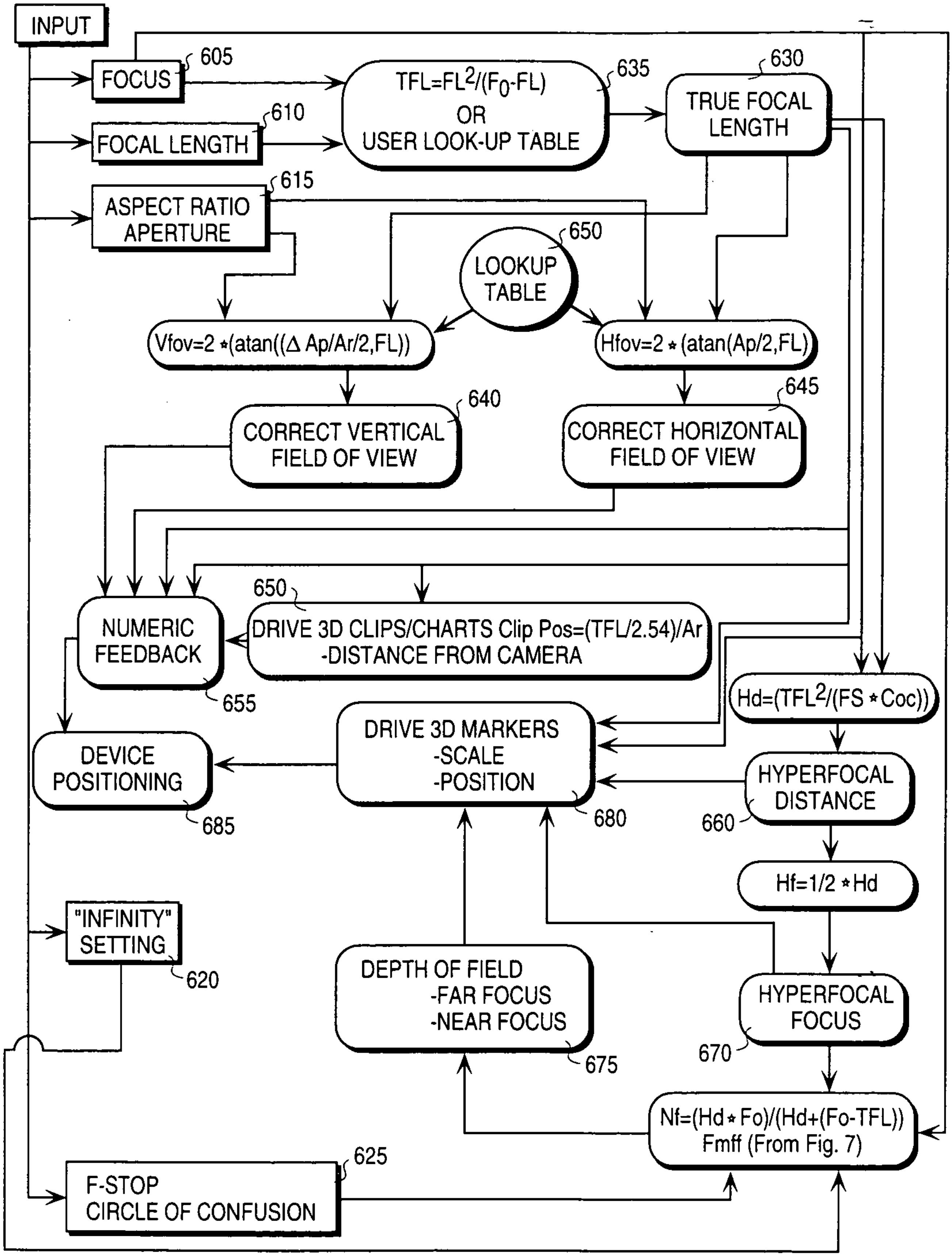
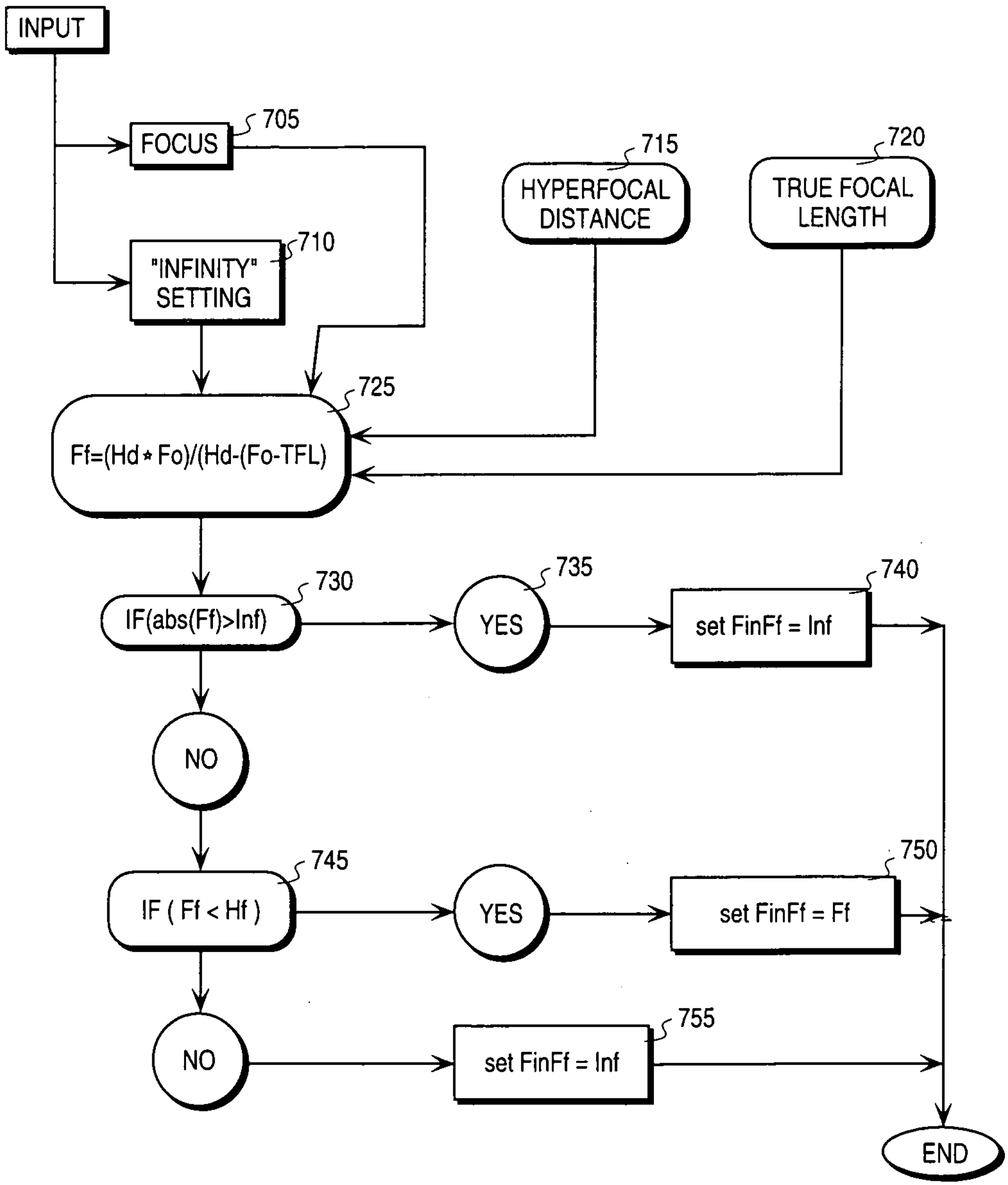

INPUT
FOCUS
605
FOCAL LENGTH
610
ASPECT RATIO APERTURE
615
TFL=FL2/(F0-FL) OR USER LOOK-UP TABLE
635
TRUE FOCAL LENGTH
630
LOOKUP TABLE
650
Vfov=2 *(atan((Δ Ap/Ar/2,FL))
Hfov=2 * (atan(Ap/2,FL)
CORRECT VERTICAL FIELD OF VIEW
640
CORRECT HORIZONTAL FIELD OF VIEW
645
650
NUMERIC FEEDBACK
655
DRIVE 3D CLIPS/CHARTS Clip Pos=(TFL/2.54)/Ar -DISTANCE FROM CAMERA
Hd=(TFL2/(FS * Coc))
DEVICE POSITIONING
685
DRIVE 3D MARKERS -SCALE -POSITION
680
HYPERFOCAL DISTANCE
660
Hf=1/2 * Hd
"INFINITY" SETTING
620
DEPTH OF FIELD -FAR FOCUS -NEAR FOCUS
675
HYPERFOCAL FOCUS
670
Nf=(Hd * Fo)/(Hd+(Fo-TFL)) Fmff (From Fig. 7)
F-STOP CIRCLE OF CONFUSION
625

FIG. 6a

Variable		Name	Standard Units	Example Value
FL	=	Focal Length	millimeters	50 mm
TFL	=	True Focal Length	millimeters	50 mm
Ap	=	Aperture	thousanths of inch	0.980"
Fs	=	F-Stop	(log values)	f5.6
Coc	=	Circle of Confusion	thousanths of inch	0.001"
Fo	=	Focus	Feet	10'
Vfov	=	Vertical Field of View	degrees	36
Hfov	=	Horizontal Field of View	degrees	52
Hd	=	Hyperfocal Distance	feet	50'
Hf	=	Hyperfocal Focus	feet	25'
Ar	=	Aspect Ratio	(ratio)	2.35
Ff	=	Far Focus Value	Feet	100'
FinFf	=	Final Calculated Far Focus	Feet	100'
Inf	=	"Infinity" setting cut-off,	Feet	100'
Nf	=	Near Focus Value	Feet	3'
Clip Pos	=	Viewfinder Clips Position	Feet	0.7'

FIG. 6b



INPUT
FOCUS
705
"INFINITY" SETTING
710
HYPERFOCAL DISTANCE
715
TRUE FOCAL LENGTH
720
Ff=(Hd*Fo)/(Hd-(Fo-TFL)
725
IF(abs(Ff)>Inf)
730
YES
735
set FinFf = Inf
740
NO
IF (Ff < Hf)
745
YES
set FinFf = Ff
750
NO
set FinFf = Inf
755
END

FIG. 7

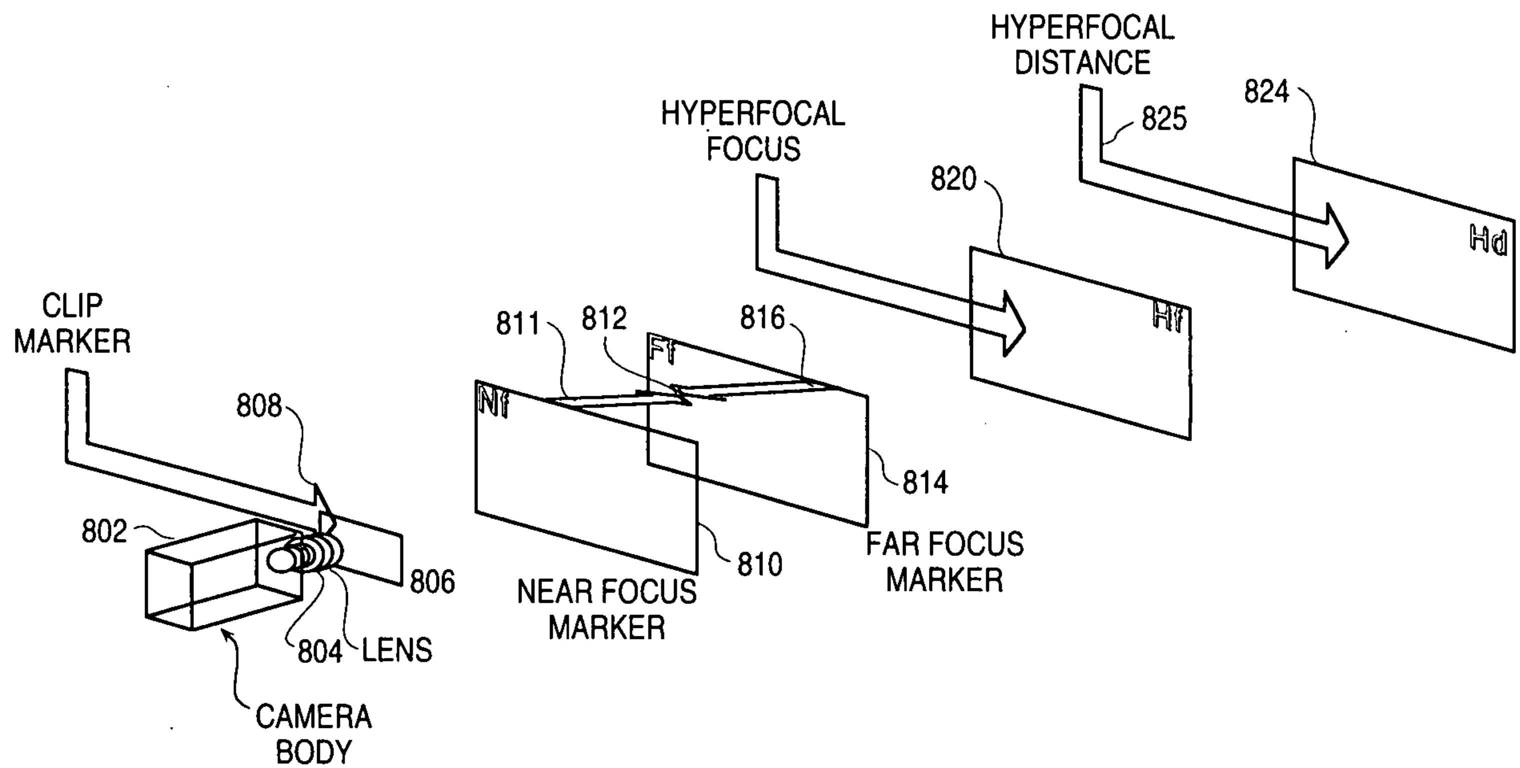
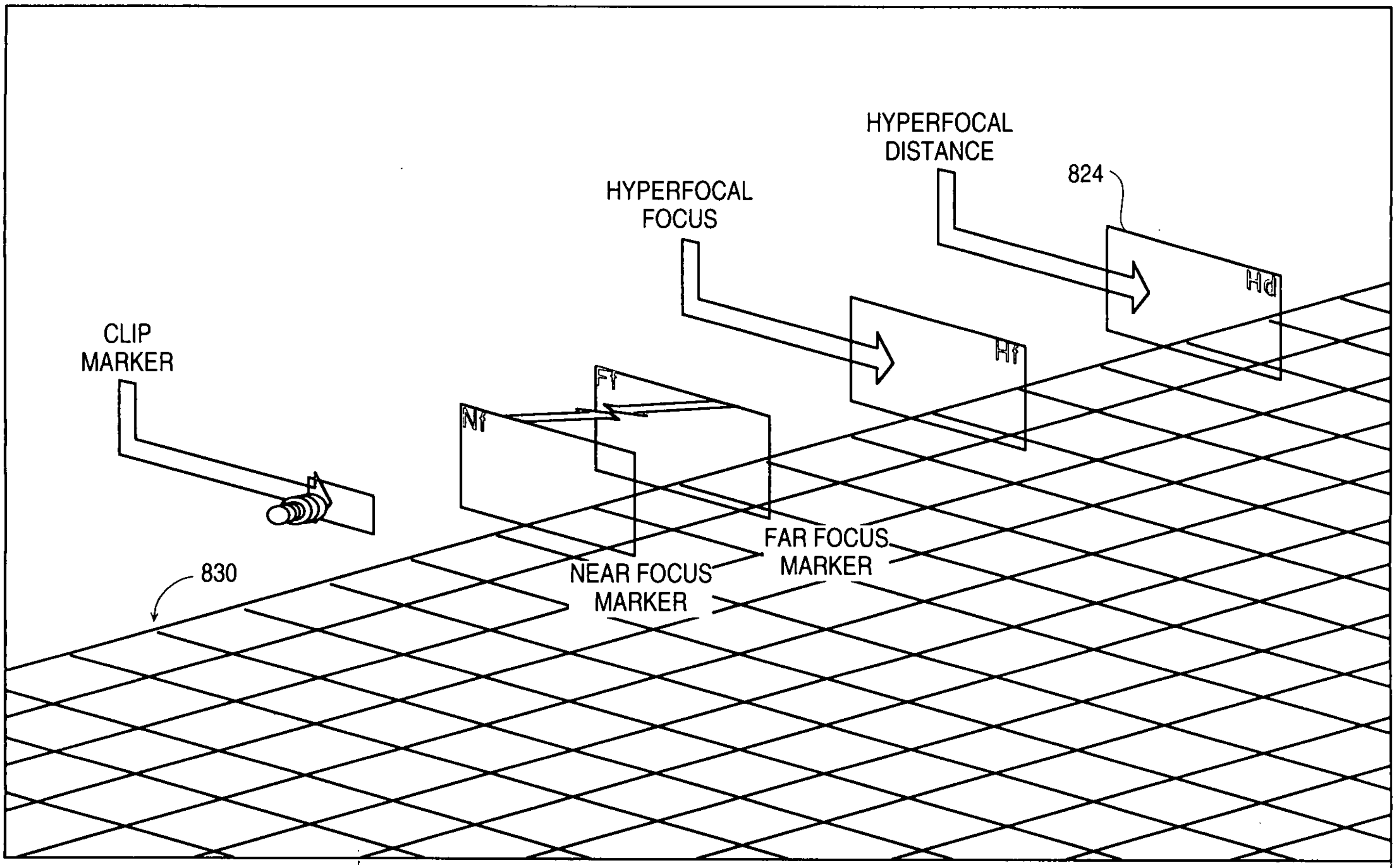

CLIP
MARKER
808
802
806
804
LENS
CAMERA
BODY
811
812
816
Nf
Ff
810
814
NEAR FOCUS
MARKER
FAR FOCUS
MARKER
HYPERFOCAL
FOCUS
820
Hf
HYPERFOCAL
DISTANCE
825
824
Hd

FIG. 8a



HYPERFOCAL
DISTANCE
824
HYPERFOCAL
FOCUS
Hd
Hf
CLIP
MARKER
Ff
Nf
FAR FOCUS
MARKER
NEAR FOCUS
MARKER
830

FIG. 8b

User set focal length = 19 mm
User set focus = 4 feet
User set f-stop = f 2.8

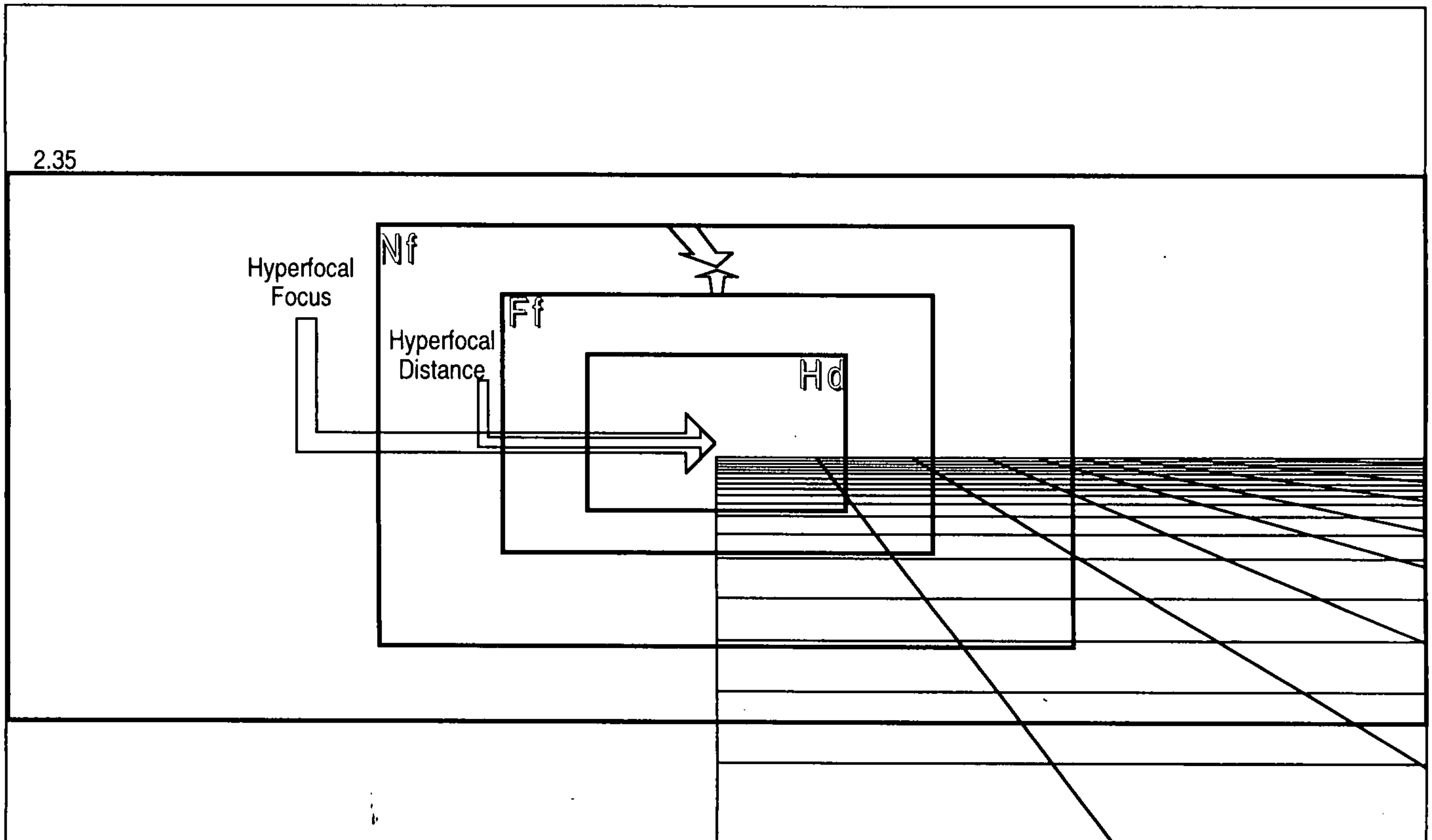


FIG. 8c

User set Focal Length	= 19 mm	Calculated Hyperfocus Distance =	17.847 feet
User set Focus	= 4 feet	Calculated Hyperfocus Focus =	8.5923 feet
User Set f-stop	= f 2.8		
		Calculated Near Focus Distance =	3.2545 feet
Calculated True		Calculated Far Focus Distance =	5.1886 feet
Focal Length	= 19.3008 mm	Reference Marker/chart Position =	0.5201 feet

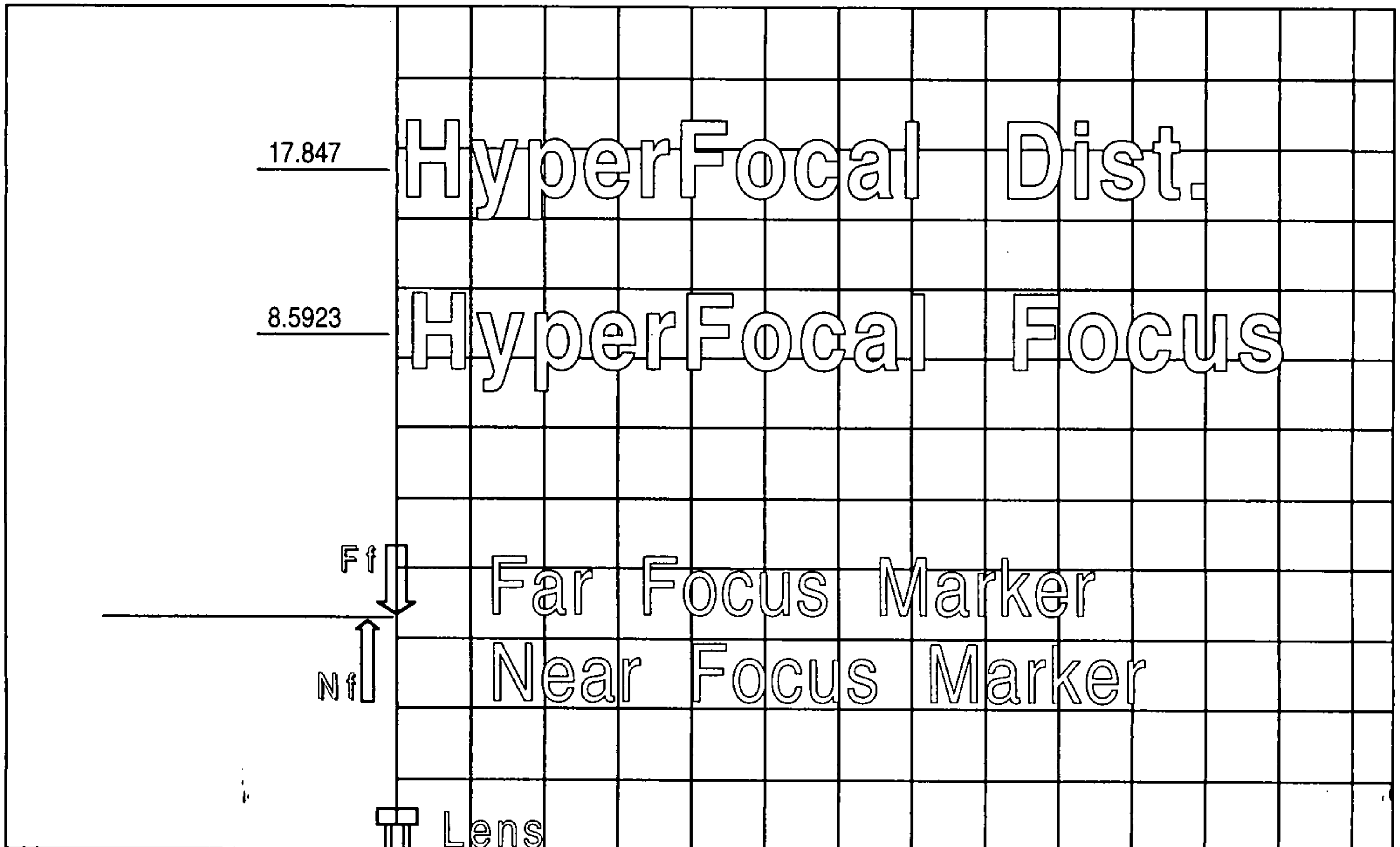


FIG. 8d

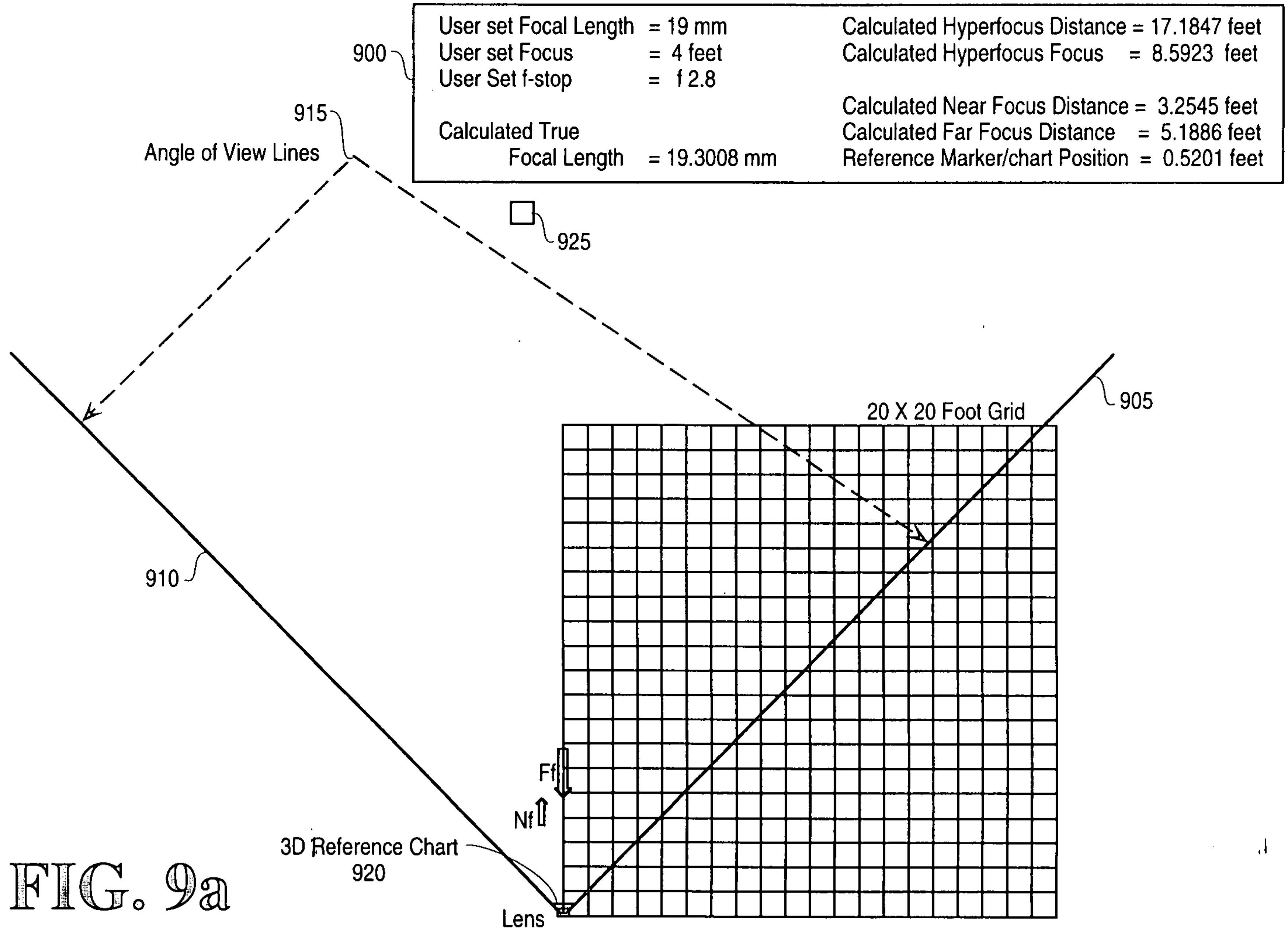

User set Focal Length = 19 mm
User set Focus = 4 feet
User Set f-stop = f 2.8
Calculated True Focal Length = 19.3008 mm
Calculated Hyperfocus Distance = 17.1847 feet
Calculated Hyperfocus Focus = 8.5923 feet
Calculated Near Focus Distance = 3.2545 feet
Calculated Far Focus Distance = 5.1886 feet
Reference Marker/chart Position = 0.5201 feet
900
915
Angle of View Lines
925
910
905
20 X 20 Foot Grid
Ff
Nf
3D Reference Chart
920
Lens

FIG. 9a

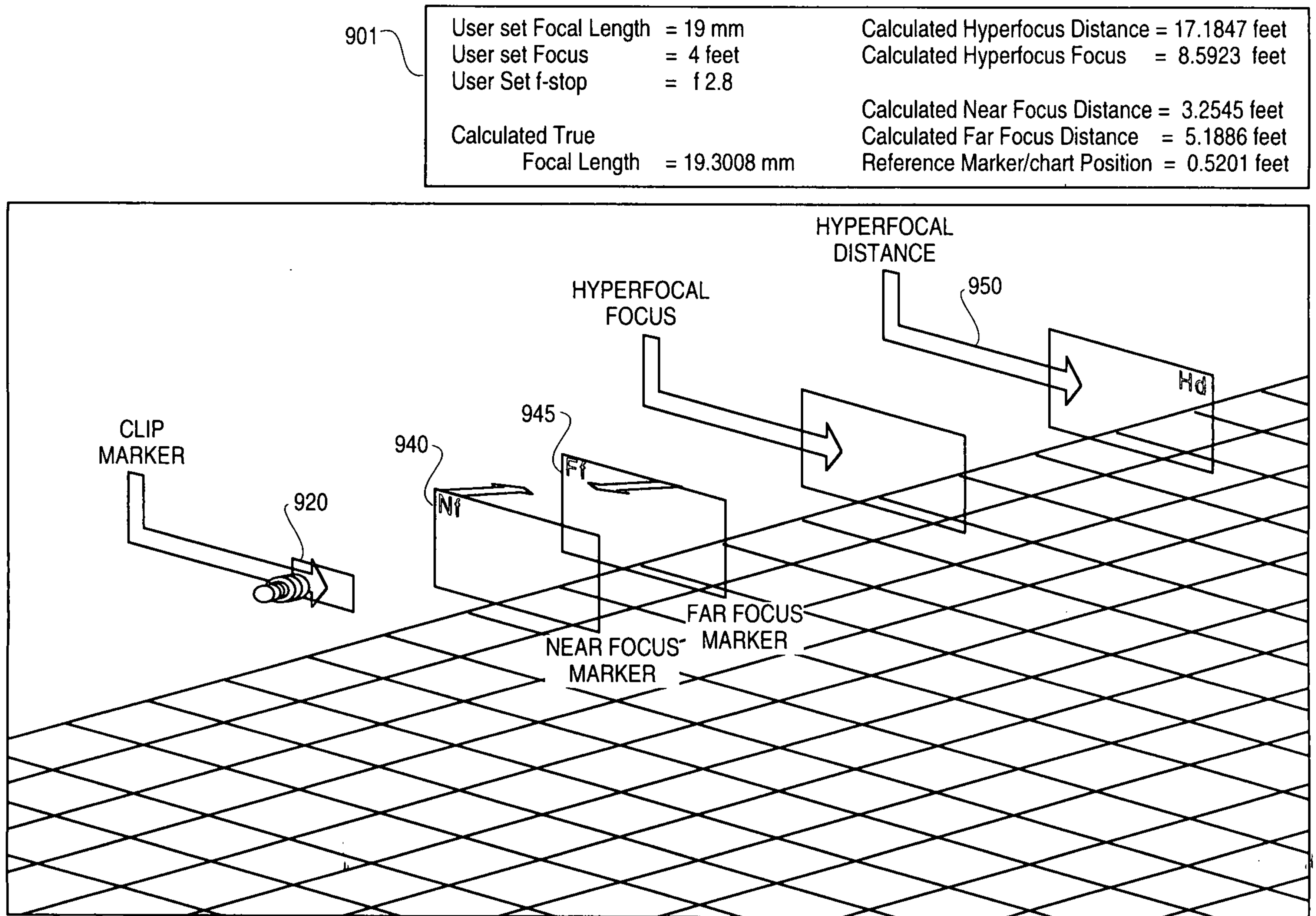

901
User set Focal Length = 19 mm
User set Focus = 4 feet
User Set f-stop = f 2.8
Calculated True Focal Length = 19.3008 mm
Calculated Hyperfocus Distance = 17.1847 feet
Calculated Hyperfocus Focus = 8.5923 feet
Calculated Near Focus Distance = 3.2545 feet
Calculated Far Focus Distance = 5.1886 feet
Reference Marker/chart Position = 0.5201 feet
HYPERFOCAL DISTANCE
950
HYPERFOCAL FOCUS
945
940
CLIP MARKER
920
Nf
Ff
Hd
FAR FOCUS MARKER
NEAR FOCUS MARKER

FIG. 9b

User set focal length = 19 mm
User set focus = 4 feet
User set f-stop = f 2.8

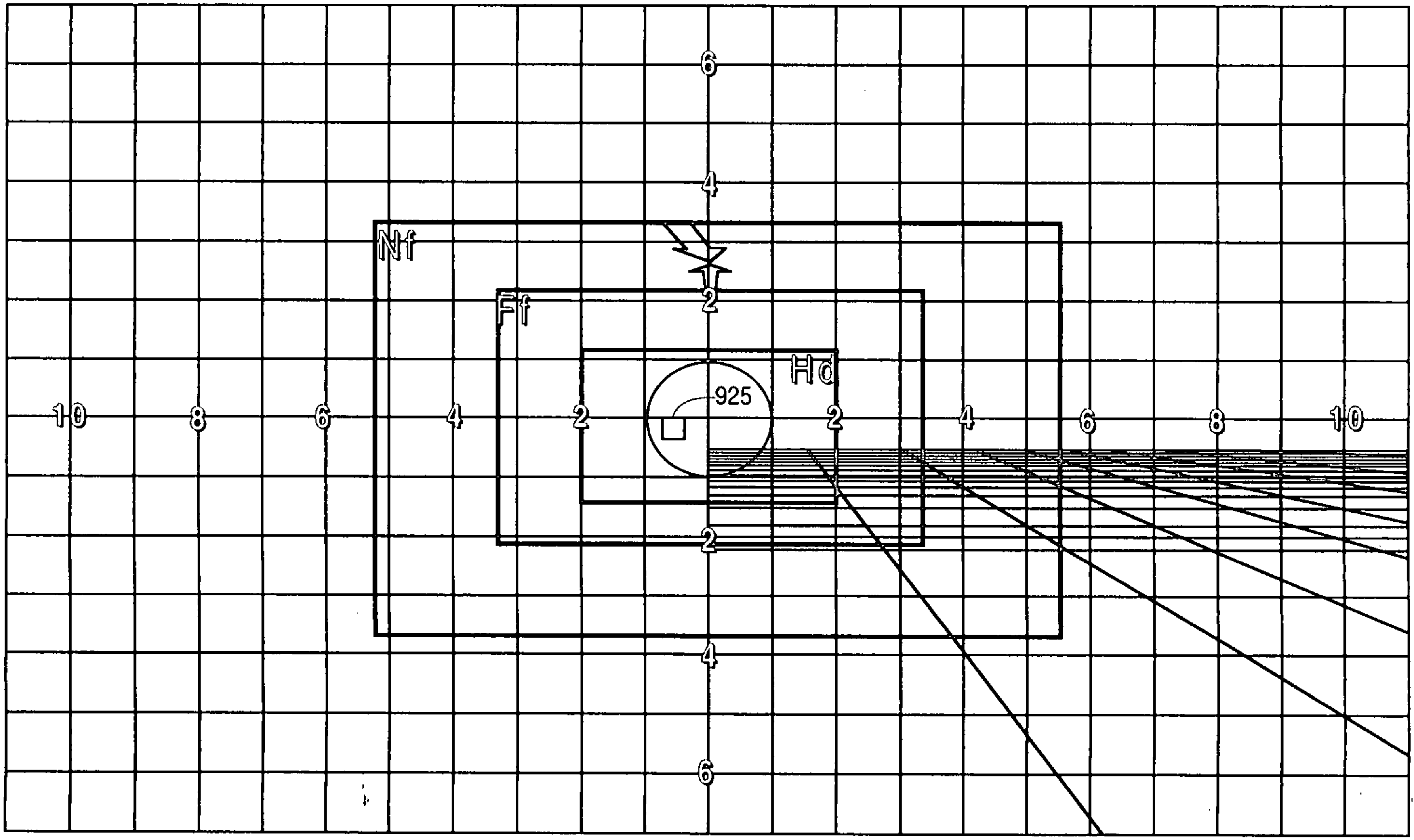


FIG. 9c

User set focal length = 19 mm
User set focus = 4 feet
User set f-stop = f 2.8

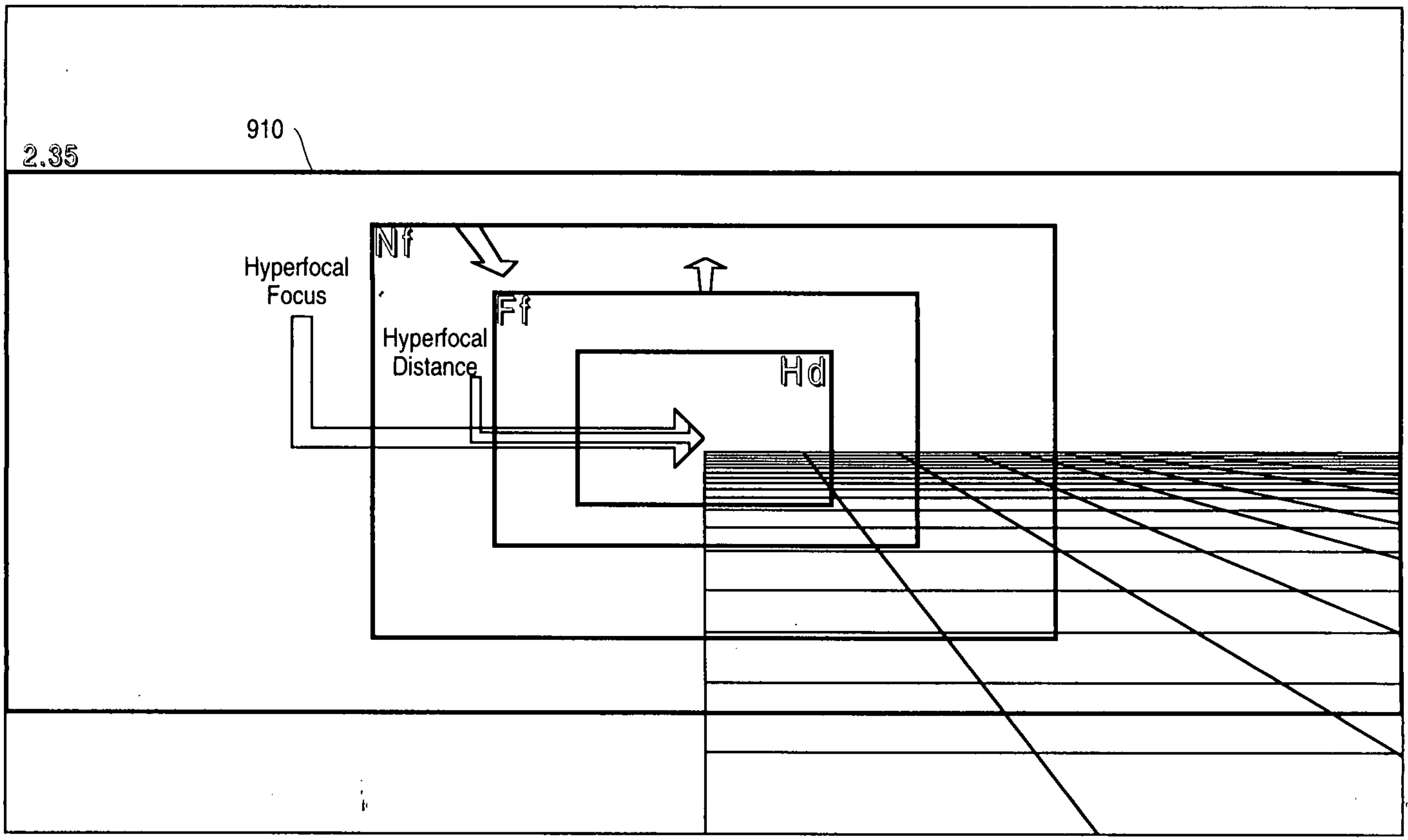


FIG. 9d

User set Focal Length	= 19 mm	Calculated Hyperfocus Distance	= 8.5923 feet
User set Focus	= 4 feet	Calculated Hyperfocus Focus	= 4.2962 feet
User Set f-stop	= f 5.6		
		Calculated Near Focus Distance	= 2.7432 feet
Calculated True Focal Length	= 19.3008 mm	Calculated Far Focus Distance	= 7.3823 feet
		Reference Marker/chart Position	= 0.5201 feet

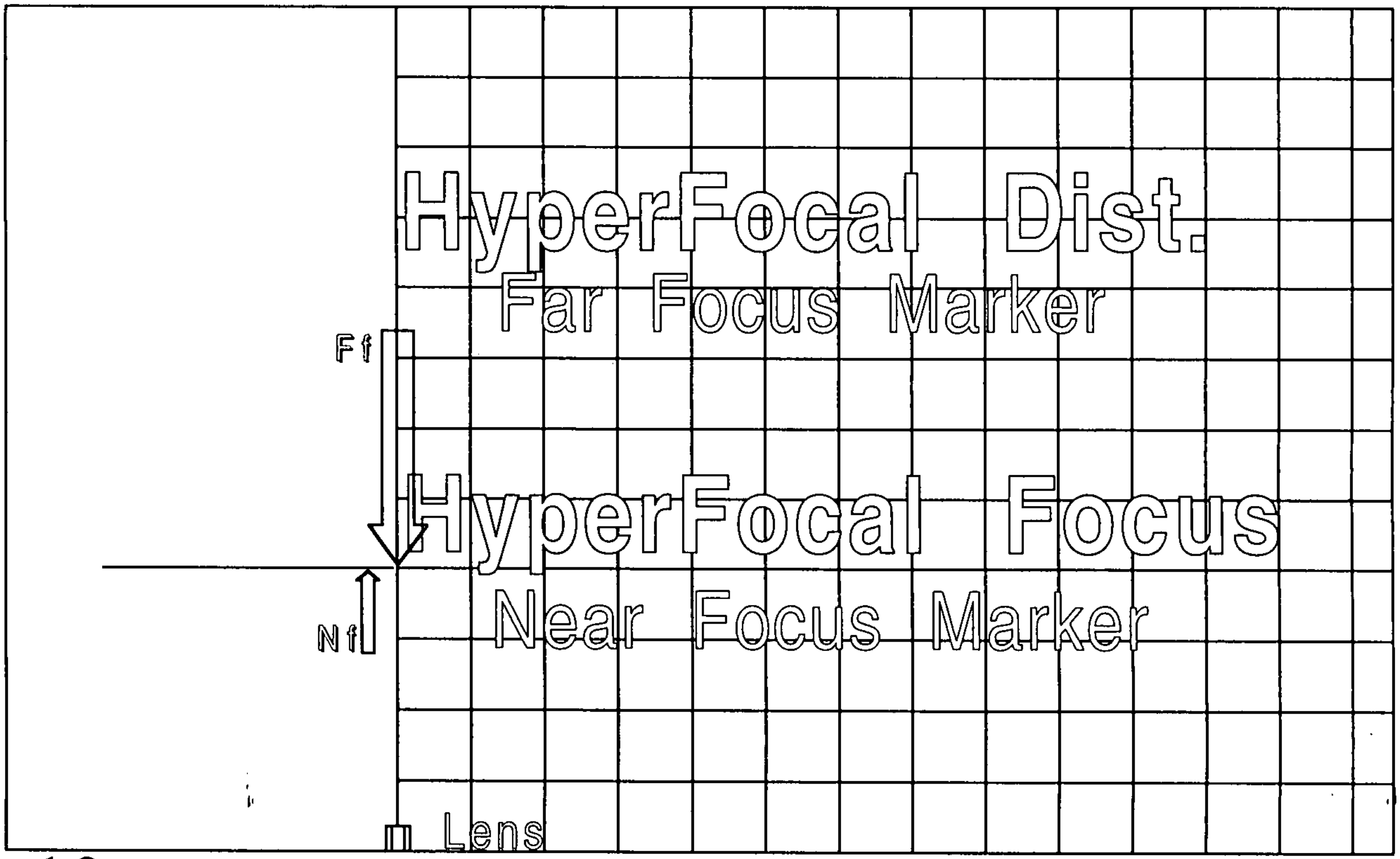


FIG. 10a

User set Focal Length = 19 mm
User set Focus = 4 feet
User Set f-stop = f 5.6

Calculated True
Focal Length = 19.3008 mm

Calculated Hyperfocus Distance = 8.5923 feet
Calculated Hyperfocus Focus = 4.2962 feet

Calculated Near Focus Distance = 2.7432 feet
Calculated Far Focus Distance = 7.3823 feet
Reference Marker/chart Position = 0.5201 feet

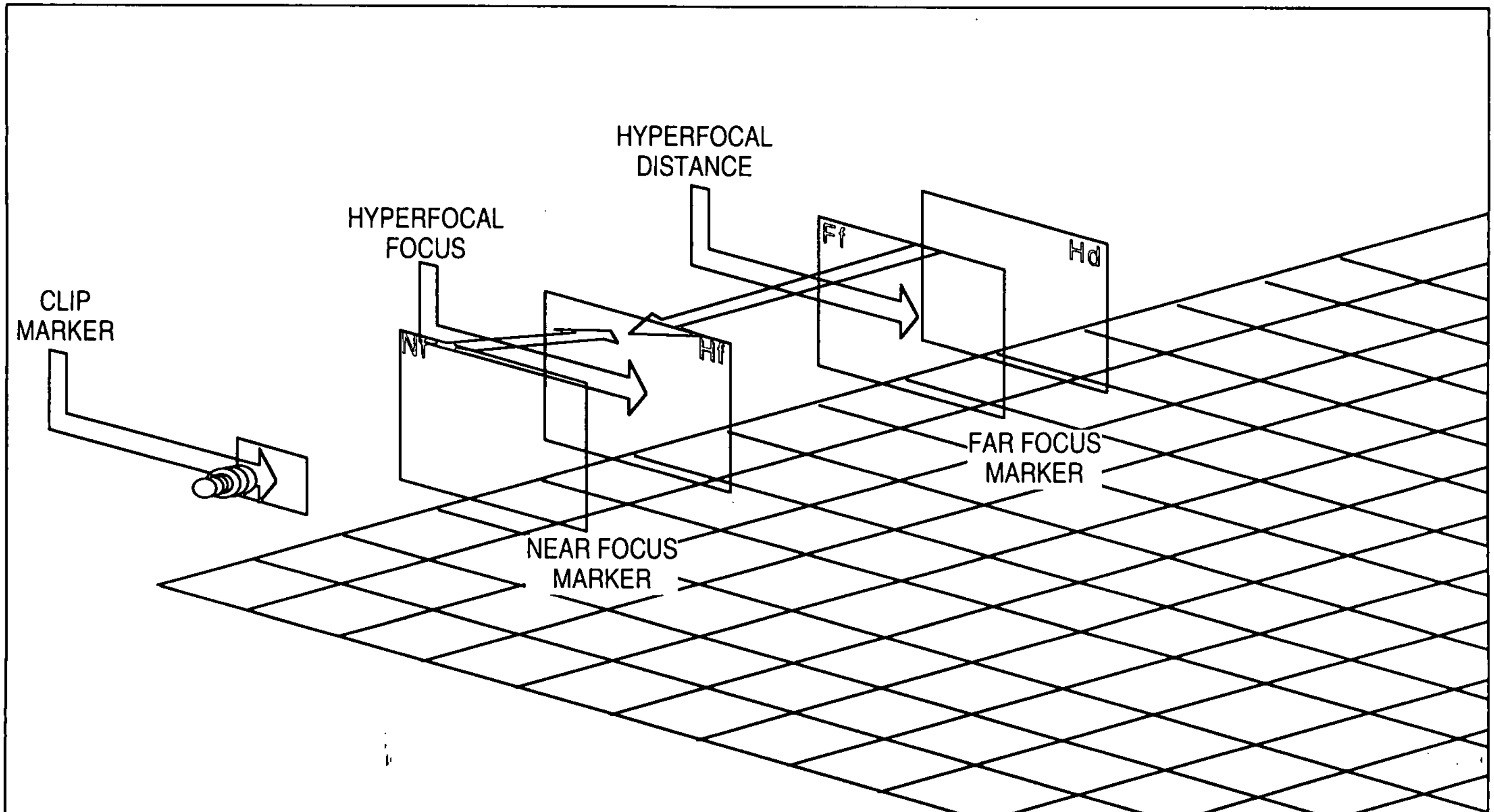


FIG. 10b

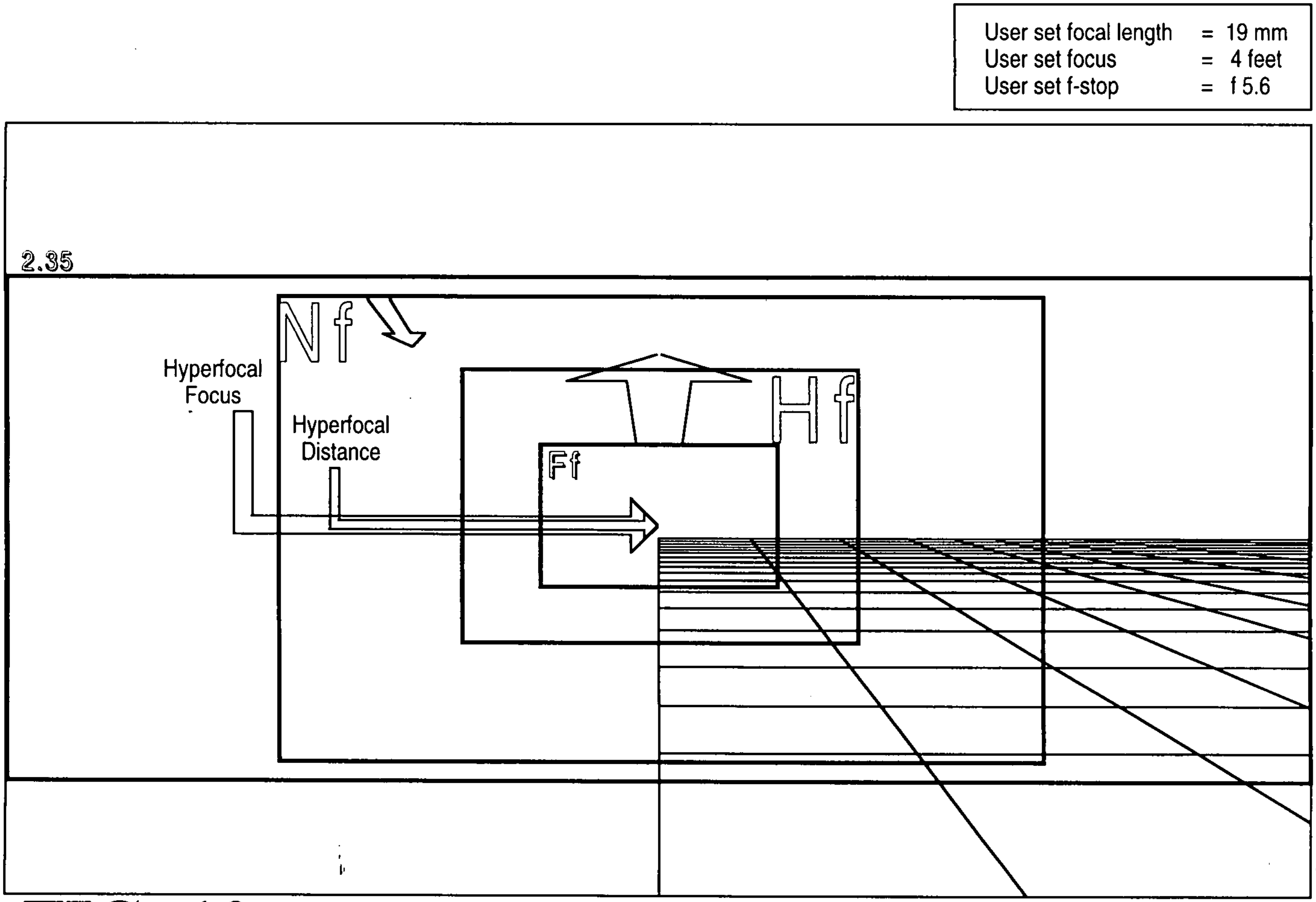

User set focal length = 19 mm
User set focus = 4 feet
User set f-stop = f 5.6
2.35
Nf
Hf
Ff
Hyperfocal Focus
Hyperfocal Distance

FIG. 10c

User set Focal Length	= 19 mm	Calculated Hyperfocus Distance	= 16.8628 feet
User set Focus	= 10 feet	Calculated Hyperfocus Focus	= 8.4314 feet
User Set f-stop	= f 2.8		
		Calculated Near Focus Distance	= 6.2921 feet
Calculated True Focal Length	= 19.1192 mm	Calculated Far Focus Distance	= 24.3487 feet
		Reference Marker/chart Position	= 0.5152 feet

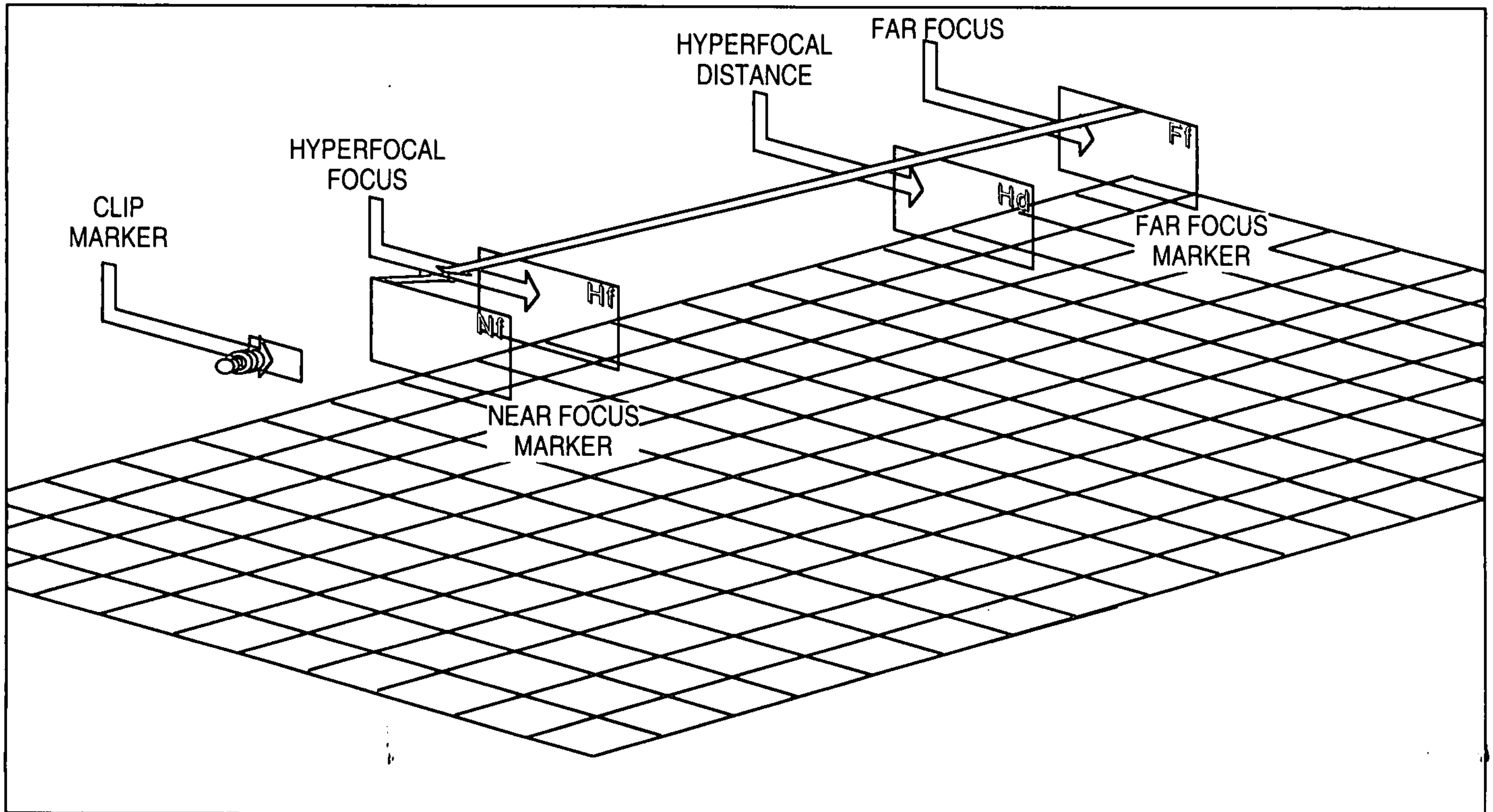


FIG. 11a

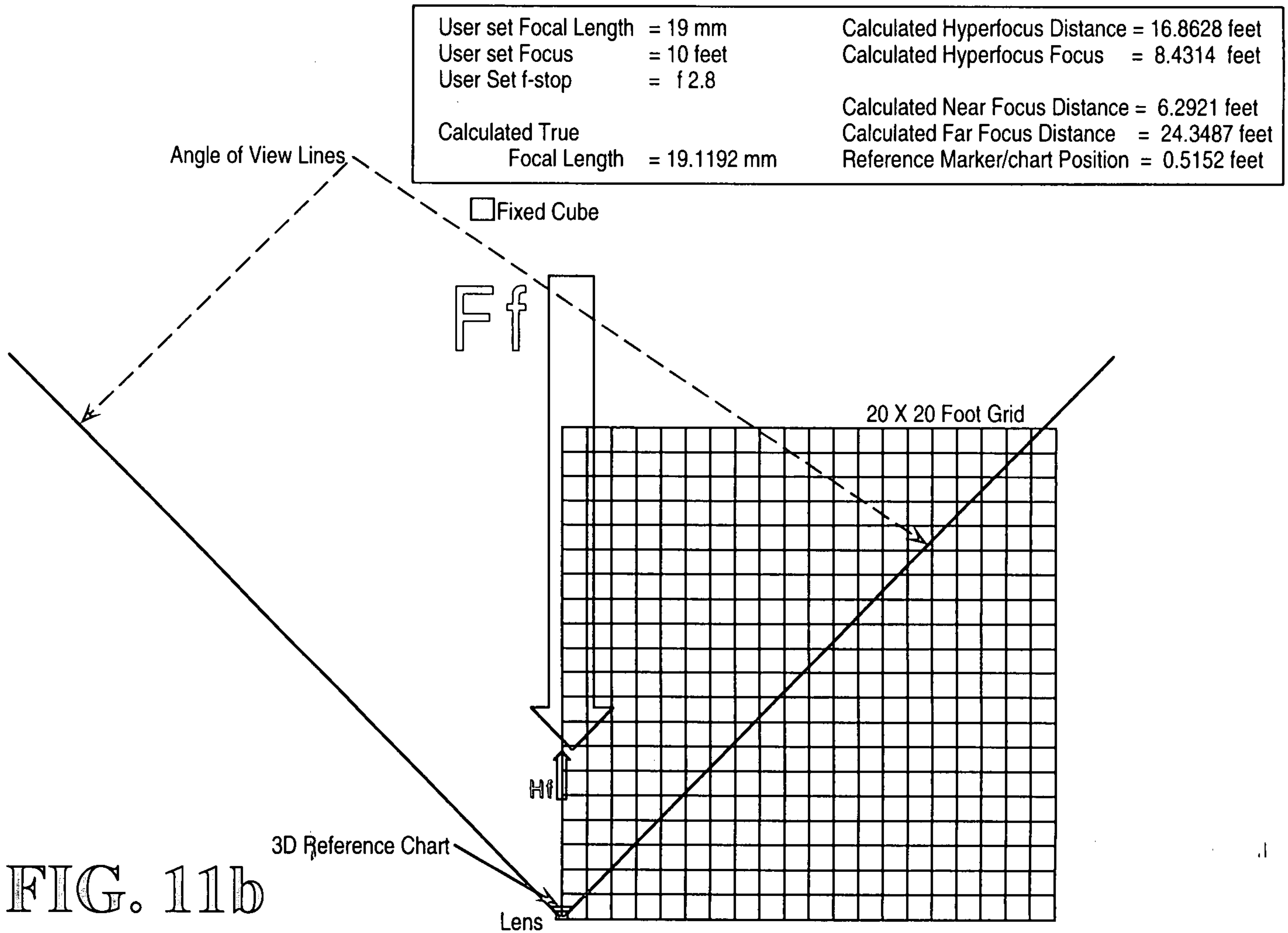

User set Focal Length = 19 mm
User set Focus = 10 feet
User Set f-stop = f 2.8
Calculated True Focal Length = 19.1192 mm
Calculated Hyperfocus Distance = 16.8628 feet
Calculated Hyperfocus Focus = 8.4314 feet
Calculated Near Focus Distance = 6.2921 feet
Calculated Far Focus Distance = 24.3487 feet
Reference Marker/chart Position = 0.5152 feet
Fixed Cube
Angle of View Lines
Ff
20 X 20 Foot Grid
Hf
3D Reference Chart
Lens

FIG. 11b

User set focal length = 19 mm
User set focus = 10 feet
User set f-stop = f 2.8

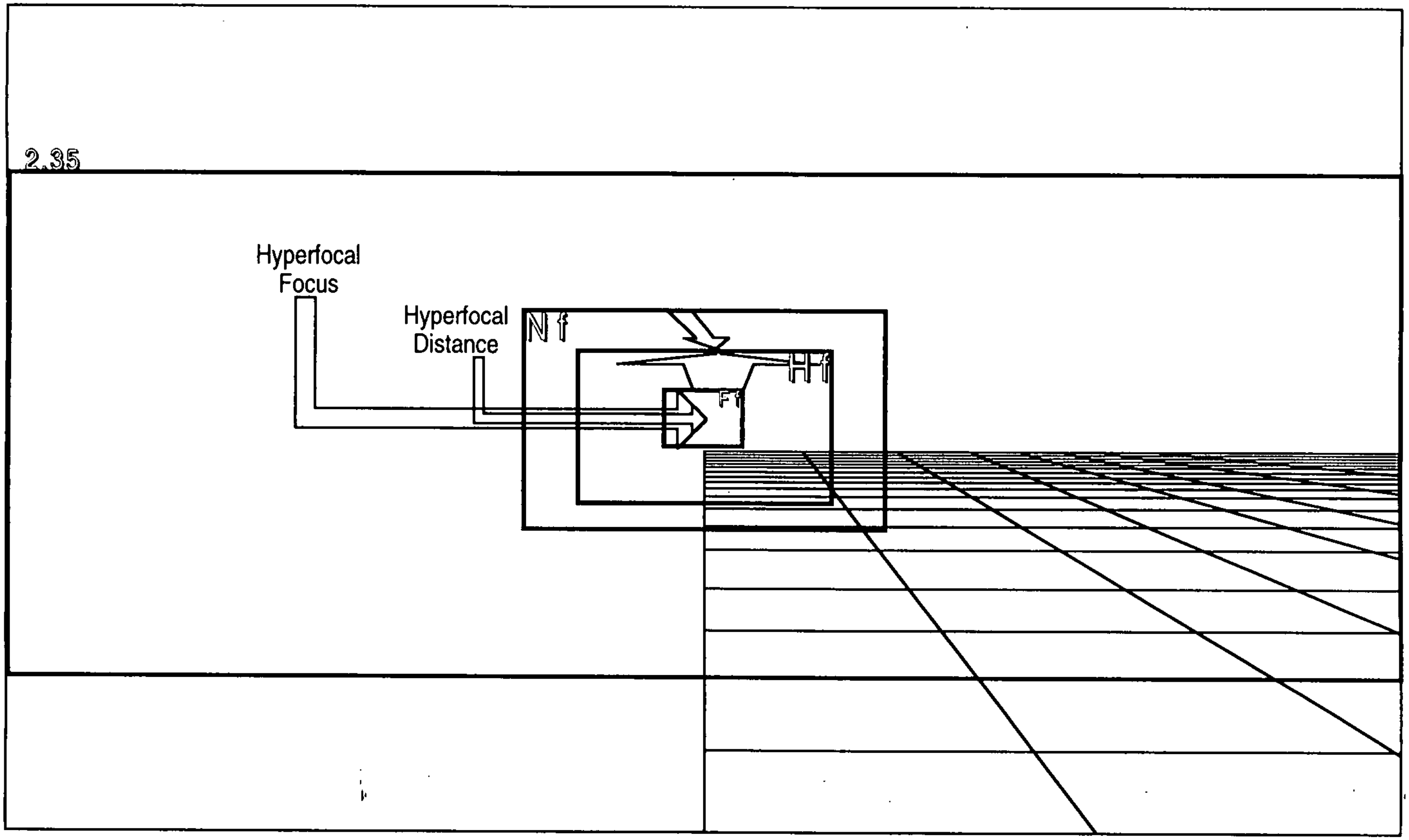


FIG. 11c

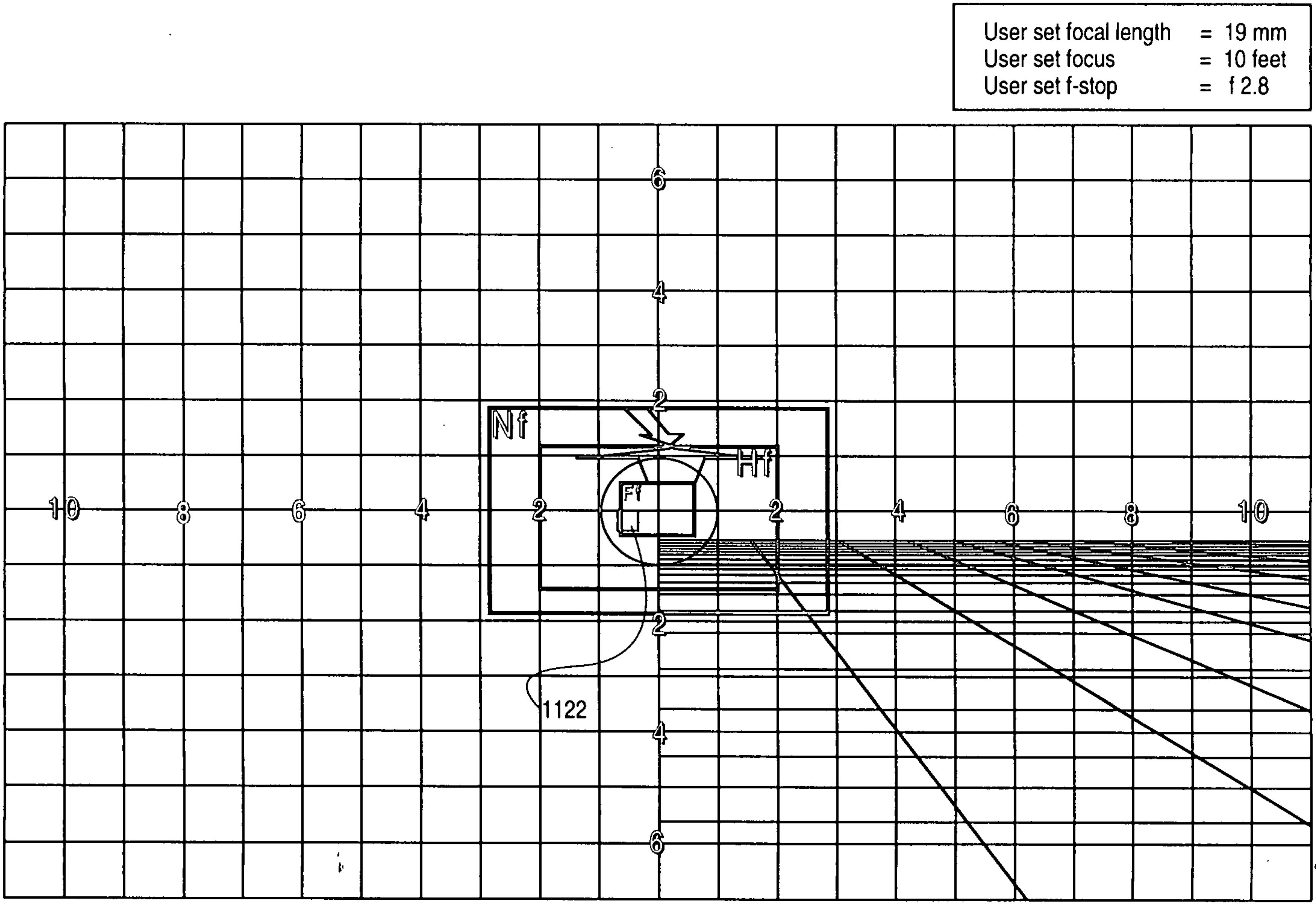

User set focal length = 19 mm
User set focus = 10 feet
User set f-stop = f 2.8
Nf
Hf
Ff
1122
10
8
6
4
2

FIG. 11d

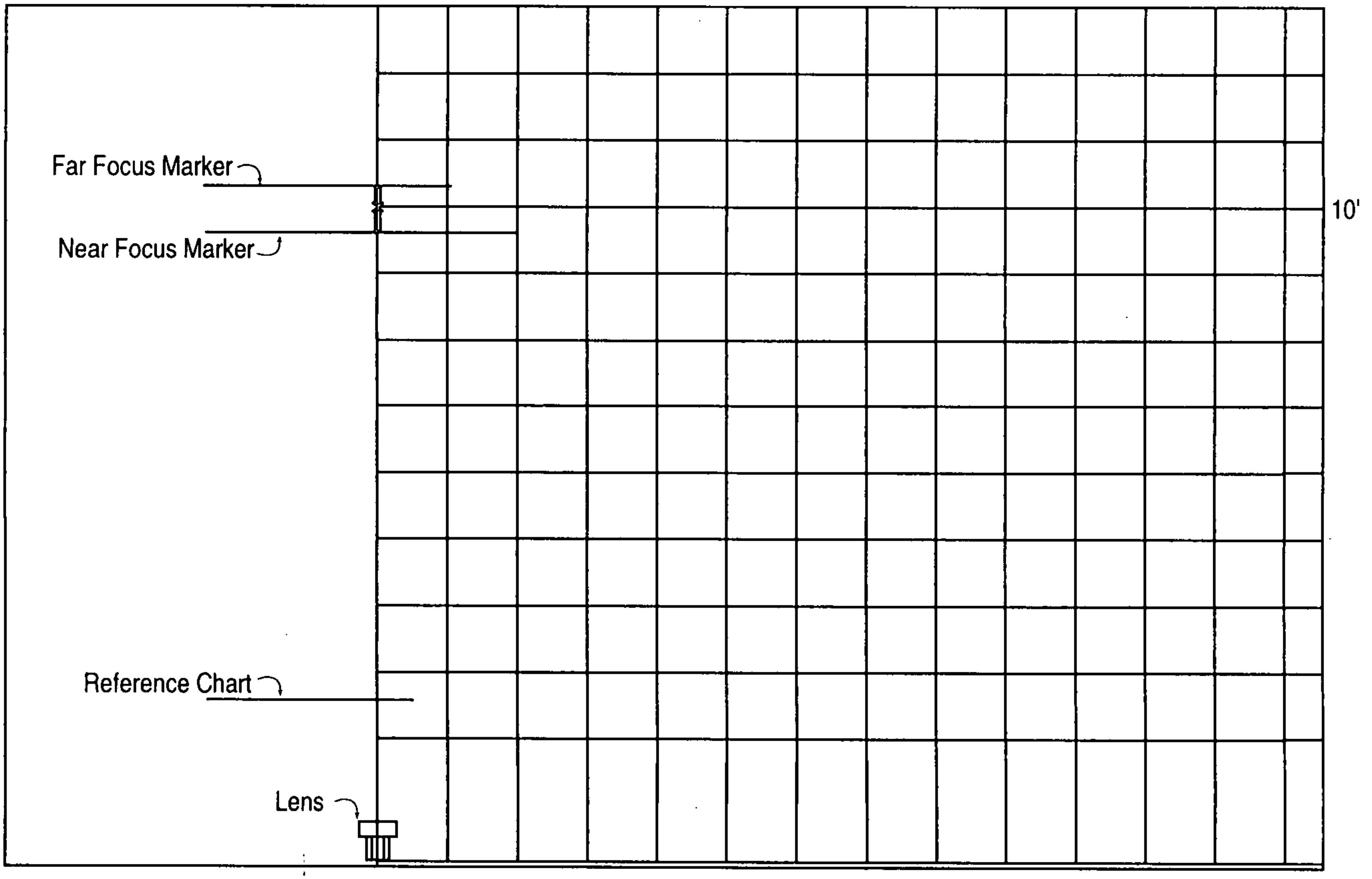
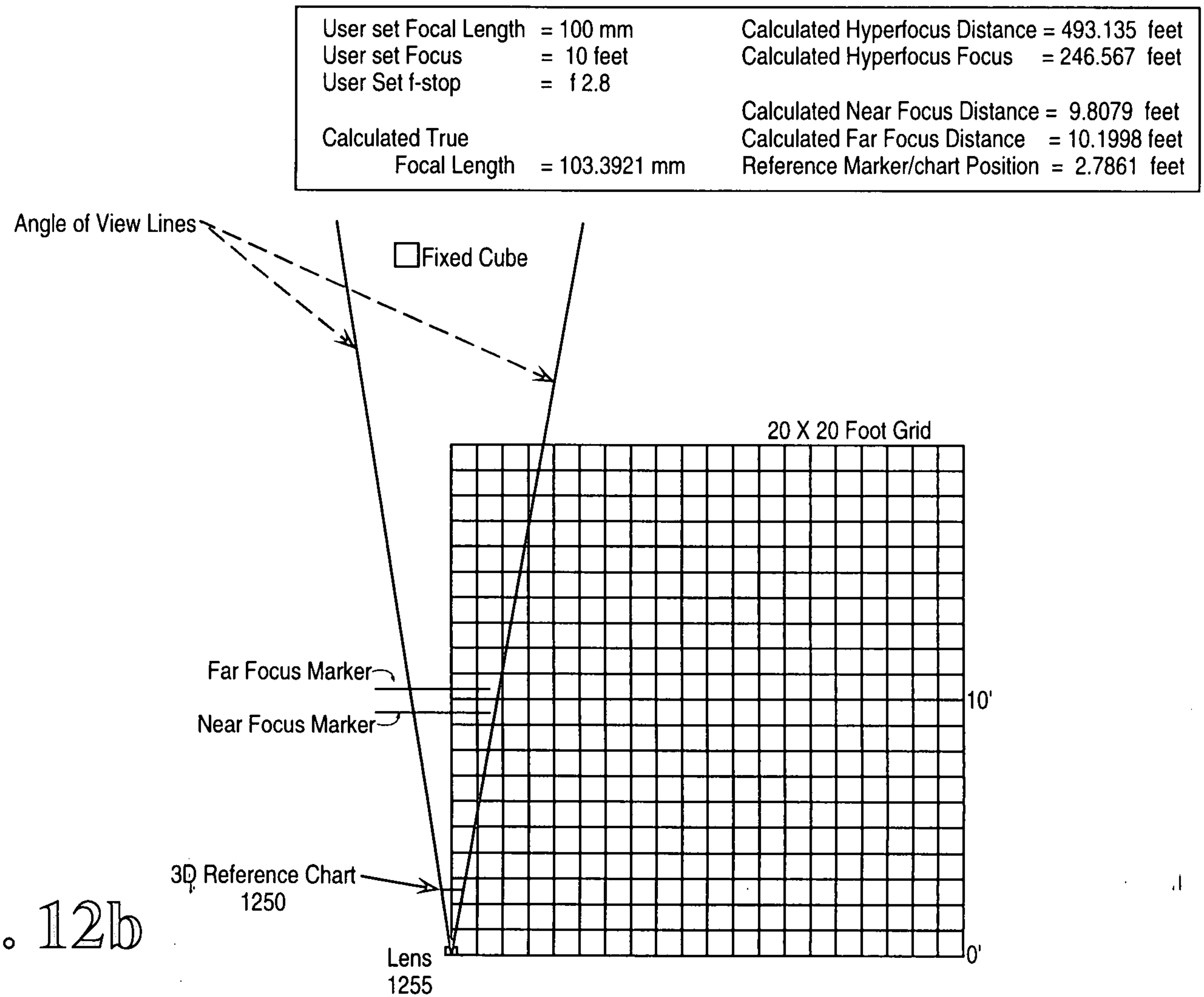


FIG. 12a



User set Focal Length = 100 mm
User set Focus = 10 feet
User Set f-stop = f 2.8
Calculated True Focal Length = 103.3921 mm
Calculated Hyperfocus Distance = 493.135 feet
Calculated Hyperfocus Focus = 246.567 feet
Calculated Near Focus Distance = 9.8079 feet
Calculated Far Focus Distance = 10.1998 feet
Reference Marker/chart Position = 2.7861 feet
Angle of View Lines
Fixed Cube
20 X 20 Foot Grid
Far Focus Marker
Near Focus Marker
10'
3D Reference Chart
1250
Lens
1255
0'

FIG. 12b

User set focal length	=	100 mm
User set focus	=	10 feet
User set f-stop	=	f 2.8

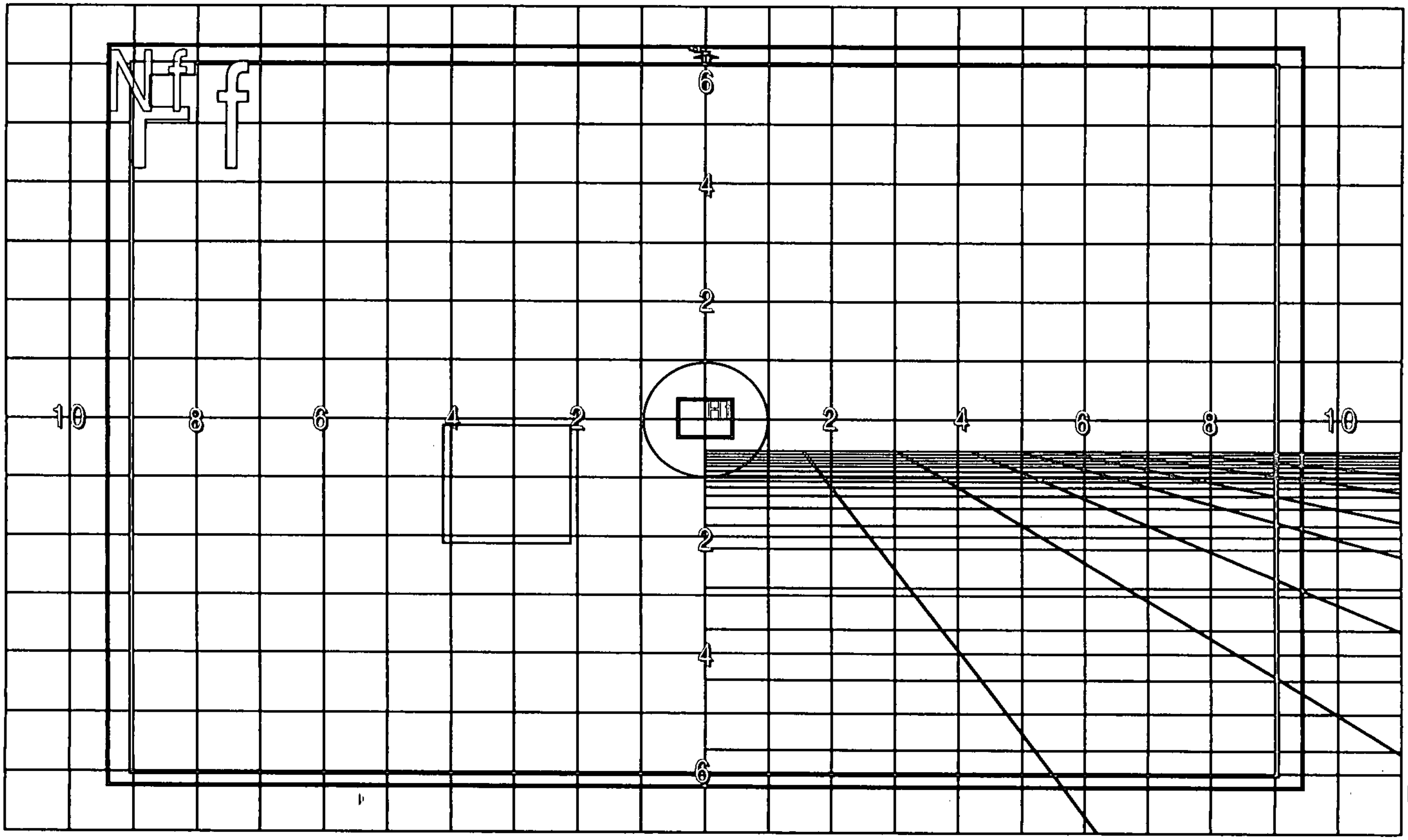


FIG. 12c

User set Focal Length	= 100 mm	Calculated Hyperfocus Distance	= 476.824 feet
User set Focus	= 20 feet	Calculated Hyperfocus Focus	= 238.412 feet
User Set f-stop	= f 2.8		
		Calculated Near Focus Distance	= 19.2078 feet
Calculated True		Calculated Far Focus Distance	= 20.8604 feet
Focal Length	= 101.6678 mm	Reference Marker/chart Position	= 2.7397 feet

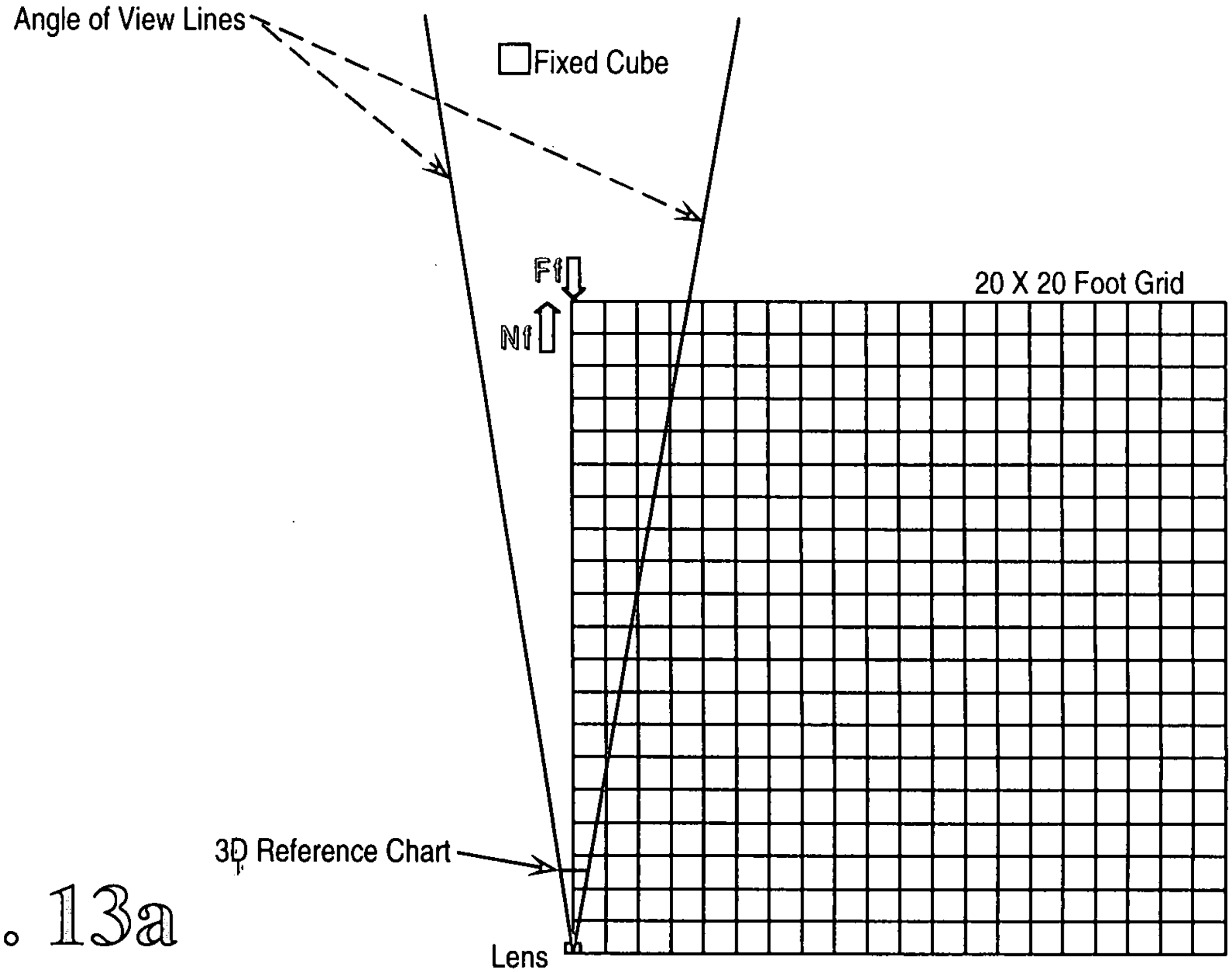


FIG. 13a

User set focal length = 100 mm
User set focus = 20 feet
User set f-stop = f 2.8

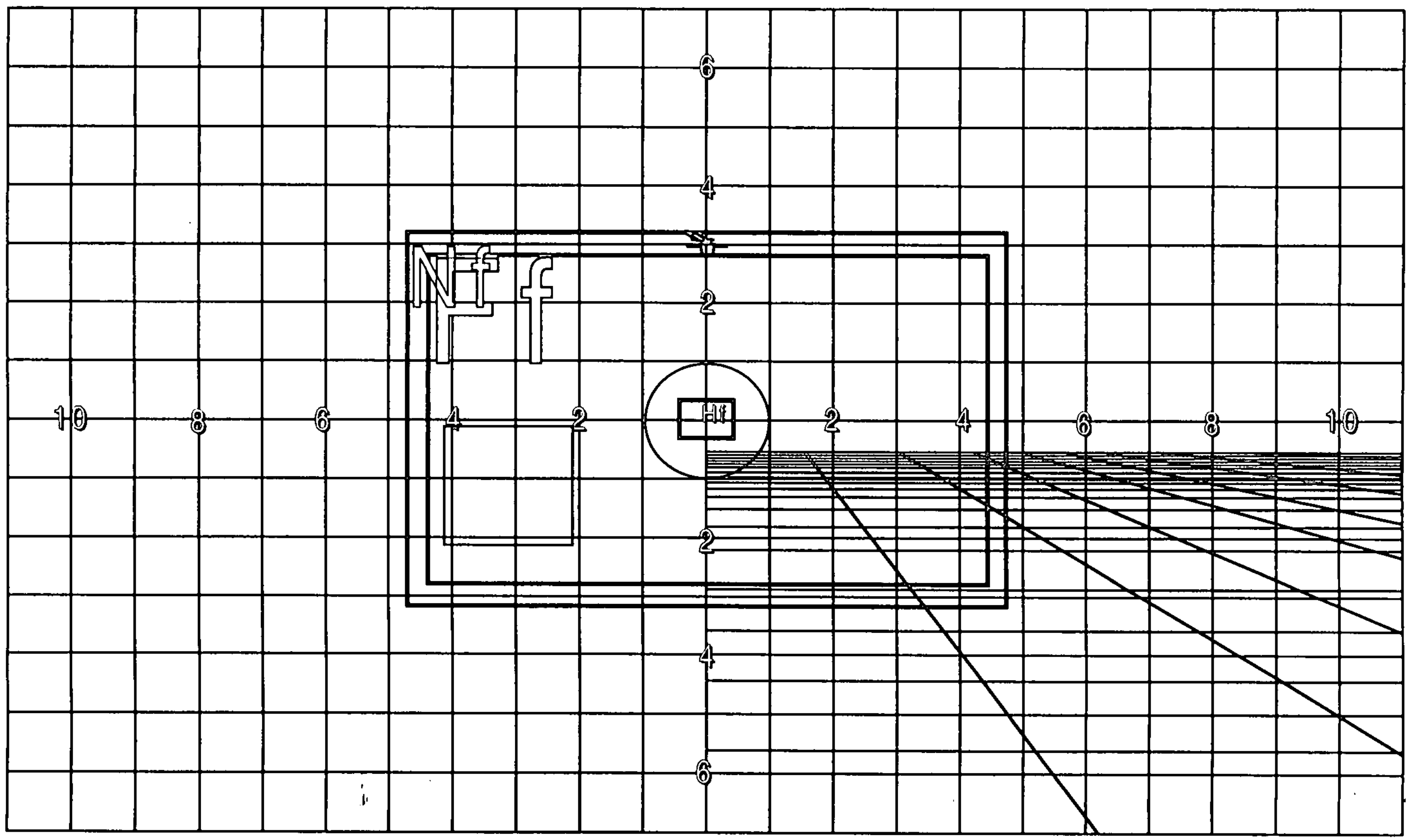


FIG. 13b

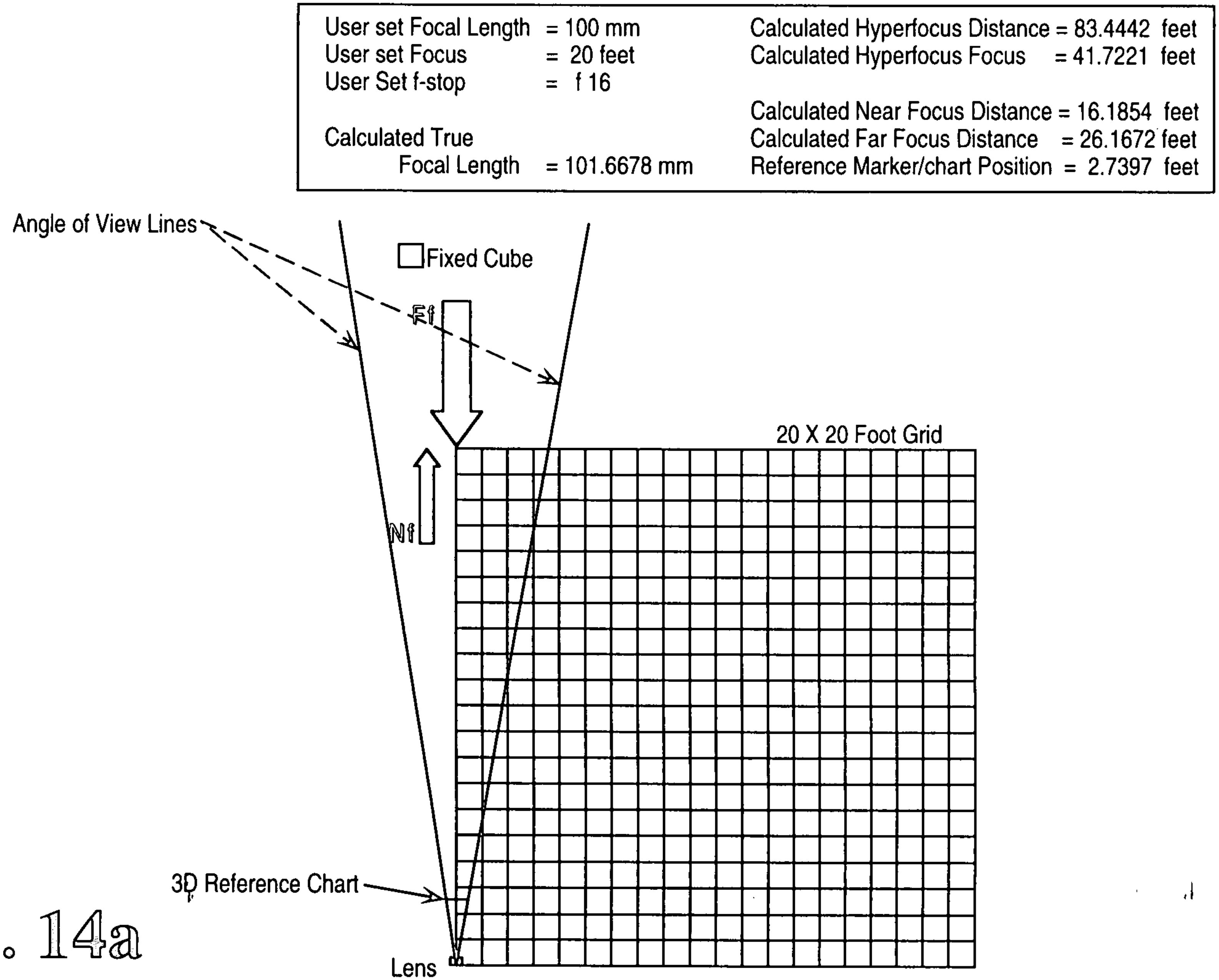

User set Focal Length = 100 mm
User set Focus = 20 feet
User Set f-stop = f 16
Calculated True Focal Length = 101.6678 mm
Calculated Hyperfocus Distance = 83.4442 feet
Calculated Hyperfocus Focus = 41.7221 feet
Calculated Near Focus Distance = 16.1854 feet
Calculated Far Focus Distance = 26.1672 feet
Reference Marker/chart Position = 2.7397 feet
Angle of View Lines
Fixed Cube
Ff
Nf
20 X 20 Foot Grid
3D Reference Chart
Lens

FIG. 14a

User set focal length = 100 mm
User set focus = 20 feet
User set f-stop = f 16

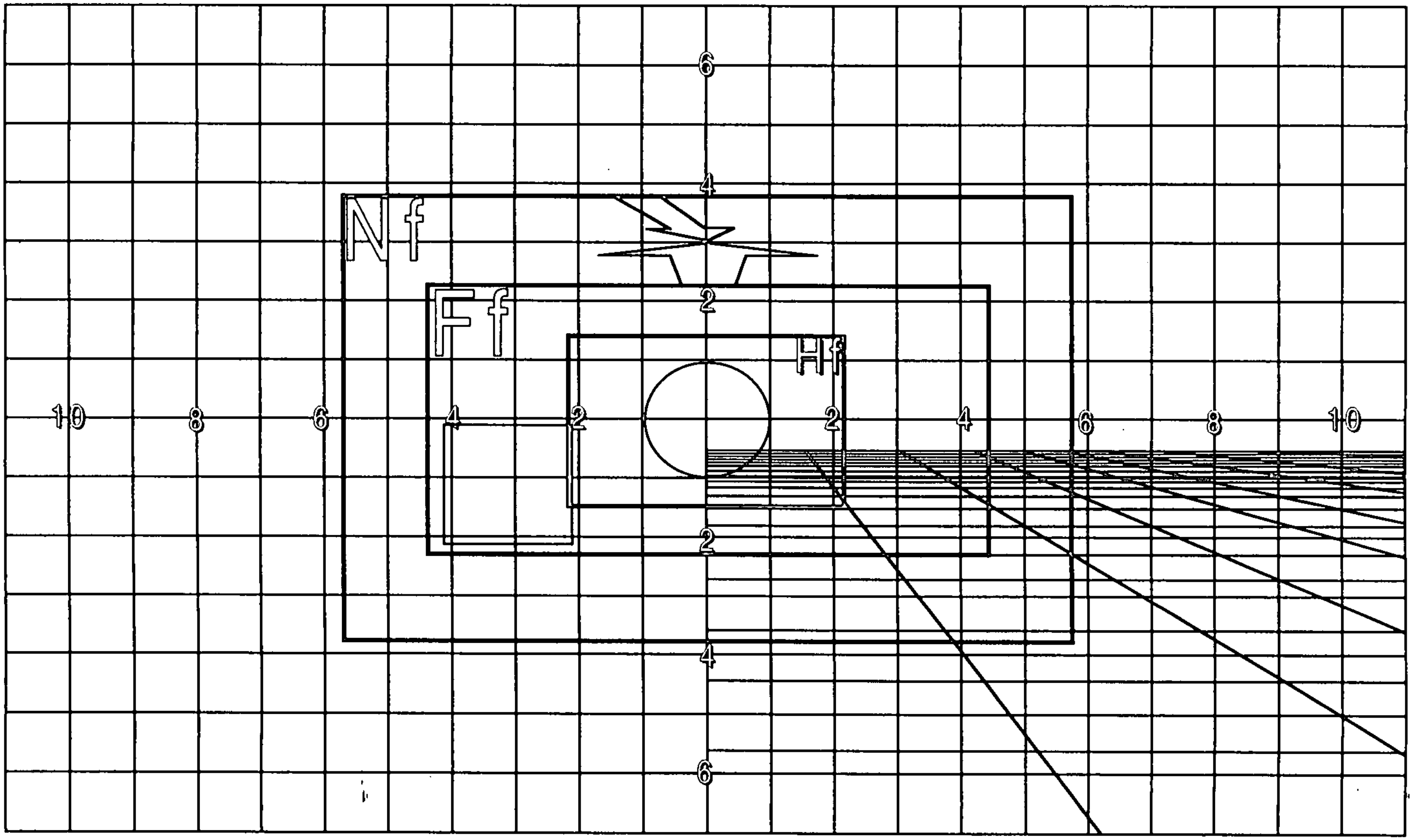


FIG. 14b